INDEPENDENT ORBITER ASSESSMENT

ANALYSIS OF THE EXTRAVEHICULAR MANEUVERING UNIT

15 DECEMBER 1986
INDEPENDENT ORBITER ASSESSMENT
ANALYSIS OF THE EXTRAVEHICULAR MOBILITY UNIT

28 November 1986

This Working Paper is Submitted to NASA under Task Order No. VA86001, Contract NAS 9-17650

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Independent Orbiter Assessment
Analysis of the Extravehicular Mobility Unit

1.0 EXECUTIVE SUMMARY

The McDonnell Douglas Astronautics Company (MDAC) was selected in June 1986 to perform an Independent Orbiter Assessment (IOA) of the Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL). Direction was given by the STS Orbiter and GFE Projects Office to perform the hardware analysis using the instructions and ground rules defined in NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. The IOA approach features a top-down analysis of the hardware to determine failure modes, criticality, and potential critical items. To preserve independence, this analysis was accomplished without reliance upon the results contained within the NASA FMEA/CIL documentation. Hardware identified for assessment includes major critical Shuttle Orbiter subsystems and all GFE hardware. This report documents the independent analysis results corresponding to the Extravehicular Mobility Unit (EMU) hardware.

The EMU is an independent anthropomorphic system that provides environmental protection, mobility, life support, and communications for the Shuttle crewmember to perform Extravehicular Activity (EVA) in Earth orbit. Two EMU's are included on each baseline Orbiter mission, and consumables are provided for three two-man EVA's.

The EMU consists of the following elements:

- Life Support System (LSS)
  - Primary Life Support Subsystem (PLSS)
  - Secondary Oxygen Pack (SOP)
  - Service and Cooling Umbilical (SCU)
  - Display and Control Module (DCM)
  - Extravehicular Communications System (EVCS)

- Caution and Warning System (CWS)

- Space Suit Assembly (SSA)
  - Hard Upper Torso (HUT)
  - Helmet
  - Arm Assembly
  - Glove Assembly
  - Lower Torso Assembly (LTA)
  - Liquid Cooling and Ventilation Garment (LCVG)
  - Insuit Drink Bag (IDB)
  - Urinary Collection Device (UCD)
  - Communications Carrier Assembly (CCA)
The IOA analysis process utilized available EMU hardware drawings and schematics for defining hardware assemblies, components, and hardware items. Each level of hardware was evaluated and analyzed for possible failure modes and effects. Criticality was assigned based upon the severity of the effect for each failure mode.

Figures 1 and 2 present a summary of the failure criticalities for each of the three major subdivisions of the EMU. A summary of the number of failure modes, by criticality, is also presented below with Hardware (HW) criticality first and Functional (F) criticality second.

<table>
<thead>
<tr>
<th>Summary of IOA Failure Modes By Criticality (HW/F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criticality:</td>
</tr>
<tr>
<td>Number :</td>
</tr>
</tbody>
</table>

For each EMU failure mode identified, the criticality and redundancy screens were examined to identify Potential Critical Items (PCIs). A summary of PCIs is presented as follows:

<table>
<thead>
<tr>
<th>Summary of IOA Potential Critical Items (HW/F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criticality:</td>
</tr>
<tr>
<td>Number :</td>
</tr>
</tbody>
</table>

The majority of these PCIs are resultant from failures which cause loss of one or more primary functions: pressurization, oxygen delivery, environmental maintenance, and thermal maintenance. It should also be noted that the quantity of PCIs would significantly increase if the SOP were to be treated as an emergency system (as it is so defined in the EMU specifications document SVHS7800) rather than as an unlike redundant element (as it is presently categorized by the NASA).
Figure 1 - LSS AND CWS ANALYSIS SUMMARY
2.0 INTRODUCTION

2.1 Purpose

The 51-L Challenger accident prompted the NASA to readdress safety policies, concepts, and rationale being used in the National Space Transportation System (NSTS). The NSTS Office has undertaken the task of reevaluating the FMEA/CIL for the Space Shuttle design. The MDAC is providing an independent assessment of the Orbiter FMEA/CIL for completeness and technical accuracy.

2.2 Scope

The scope of the independent FMEA/CIL assessment activity encompasses those Shuttle Orbiter subsystems and GFE hardware identified in the Space Shuttle Independent FMEA/CIL Assessment Contractor Statement of Work. Each subsystem analysis addresses hardware, functions, internal and external interfaces, and operational requirements for all mission phases.

2.3 Analysis Approach

The independent analysis approach is a top-down analysis utilizing as-built drawings to breakdown the respective subsystem into components and low-level hardware items. Each hardware item is evaluated for failure mode, effects, and criticality. These data are documented in the respective subsystem analysis report, and are used to assess the NASA and Prime Contractor FMEA/CIL reevaluation results. The IOA analysis approach is summarized in the following Steps 1.0 through 3.0. Step 4.0 summarizes the assessment of the NASA and Prime Contractor FMEAs/CILs that is performed and documented at a later date.

Step 1.0 Subsystem familiarization
1.1 Define subsystem functions
1.2 Define subsystem components
1.3 Define subsystem specific ground rules and assumptions

Step 2.0 Define subsystem analysis diagram
2.1 Define subsystem
2.2 Define major assemblies
2.3 Develop detailed subsystem representations

Step 3.0 Failure events definition
3.1 Construct matrix of failure modes
3.2 Document IOA analysis results
Step 4.0 Compare IOA analysis data to NASA FMEA/CIL
   4.1 Resolve differences
   4.2 Review in-house
   4.3 Document assessment issues
   4.4 Forward findings to Project Manager

2.4 EMU Ground Rules and Assumptions

Due to the unique functions performed by the EMU, the IOA project determined it necessary to establish ground rules and assumptions specifically applicable to the EMU (reference Appendix B). These ground rules and assumptions, in addition to those established project wide (also provided in Appendix B), are intended to both complement and supplement those defined in NSTS 22206. Additional, they ensure that the IOA EMU analysis is capable of being understood by personnel who did not directly participate in the analysis.
3.0 SYSTEM DESCRIPTION

3.1 Design and Function

The Extravehicular Mobility Unit (EMU) is an independent anthropomorphic system that provides environmental protection, mobility, life support, and communications for the Space Shuttle crewmember to perform Extravehicular Activity (EVA) in Earth orbit. EVA has been defined for EMU analysis considerations as any time the EMU external environment pressure is below 4.0 psia. A schematic of the EMU is provided in Figure 3.

The EMU has been designed to accommodate an EVA mission with a total duration of 7 hours maximum, consisting of 15 minutes for egress, 6 hours for useful EVA tasks, 15 minutes for ingress, and a 30 minute reserve.

The EMU primarily consists of the Life Support System (LSS), Space Suite Assembly (SSA), and the Caution and Warning System (C&W).

1. **Life Support Subsystem (LSS)** - The LSS subsystem provides the following for the suited crewmember:
   
   a. Pressurization  
   b. Thermal control  
   c. Breathing oxygen  
   d. Display and control of critical system parameters  
   e. Humidity, odor, and contaminant control  
   f. Electrical power storage and distribution  
   g. Communications

The assemblies and hardware which make up the LSS are described below.

- The Primary Life Support Subsystem (PLSS), reference Figure 4, is an assembly which normally provides the crewmember with oxygen for breathing, ventilation, and pressurization and water for cooling. Additionally, with respect to the IOA analysis, the PLSS provides for the storage and distribution of power throughout the EMU and for the maintenance of the suit atmosphere.

The PLSS consists of oxygen bottles and water tanks together with associated regulators, relief valves, and plumbing. Also contained within the PLSS are a water pump, an air circulation fan, a sublimator used for water cooling, and a water separator used to remove excess moisture from the ventilation lines. Integral to the PLSS are several sensors used by the Caution and Warning System (CWS) in monitoring life support subsystem function.
Figure 3 - EMU FUNCTIONAL SCHEMATIC
Figure 4 - PLSS, EVCS, AND CWS
Within the PLSS, the Contaminant Control Cartridge (CCC) contains an activated charcoal bed for trace gas removal, a LiOH bed for CO₂ removal, and a particulate filter to remove solid particles. The CCC is installed in the back of the PLSS and is replaceable in flight for EMU recharge.

EMU mission power requirements during EVA are satisfied by the PLSS battery which stores and provides the electrical power for the operation of all electric components of the EMU, reference Figure 5. The battery mounts into the back of the PLSS, is replaceable in flight, and can be recharged while installed in the PLSS.

The Secondary Oxygen Pack (SOP), reference Figure 6, is a functionally independent life support system, providing the EMU with an emergency back-up oxygen system for a minimum of 30 minutes. It provides oxygen for suit-loop backup pressure regulation and an open loop oxygen purge for removal of heat, CO₂, and humidity in the event of a loss of the primary function. The SOP is mounted to the bottom of the PLSS and employs the same oxygen delivery path as the PLSS. Due to the numerous critical functions supported by the SOP, its operation and hardware are discussed in detail in the following paragraphs.

The SOP assembly contains two oxygen storage pressure vessels, a two stage regulator, a dial-type pressure gauge, a pressure transducer, and an oxygen fill connector (for servicing the SOP through Ground Servicing Equipment only).

Oxygen from the SOP is controlled by a two-stage regulator. The second-stage regulator also acts as the shutoff valve for this system. The second-stage regulator is caged when the oxygen actuator is in the OFF, IV, and PRESS positions. When the oxygen actuator is placed in the EVA position, the second-stage regulator is uncaged and oxygen is allowed to flow as demanded. The second-stage regulator also has a manual override that provides for crewmember checkout of the SOP during Pre-EVA operations.

The first-stage regulator reduces the nominal supply pressure of approximately 6000 psig to an interstage pressure of 240 to 280 psig. The second-stage regulator further reduces the inter-stage pressure to maintain the ventilation loop at
3.33 to 3.55 psid over a flow range of 4.51 to 5.26 lb/hr, 3.33 to 3.9 psid over 1.01 to 4.5 lb/hr, and 3.4 to 3.9 psid over 0.06 to 1 lb/hr.

If the second-stage regulator fails open, the outlet of the regulator acts as a flow-limiting orifice, limiting flow to 7.49 lb/hr, allowing the suit relief valve to maintain suit pressure. The second-stage regulator is designed to maintain suit pressure with an upstream pressure equal to full tank pressure.

Initiation of the SOP pressure make-up requires no action by the crewmember. The SOP purge is used to deliver oxygen or to remove CO2, heat, and humidity from the system and is initiated by the crewmember manually opening the DCM purge valve. In this manner, suit pressure is controlled to 3.33 to 3.9 psid and a maximum oxygen flow of 4.9 lb/hr is delivered from the SOP through the helmet over the body, and then overboard via the purge valve to remove CO2, heat, and humidity. A backflow check valve in the PLSS ventilation duct helps direct all flow to the helmet.

If the purge is initiated by the crewmember opening the helmet purge valve on the helmet. Suit pressure is controlled from 3.33 to 3.9 psid and a flow of 2.5 lb/hr is delivered through the helmet. Flow in this mode is into the helmet through the vent pad, over and around the crewmember's head, and then out through the helmet purge valve; no cooling is provided.

DCM - The Displays and Controls Module (Figure 7) contains the visual displays and electrical and mechanical controls required for operation of the EMU by the EVA crewmember. Contained in the DCM are the cooling control valve, the suite pressure gauge, a purge valve, the SCU interface connector, a significant portion of the EMU electrical control electronics and switches, and the remote actuator for oxygen regulators. The DCM mounts directly to the front of the HUT.

SCU - The Service and Cooling Umbilical is a 12-ft umbilical that consists of three water hoses, a high-pressure oxygen hose, electrical wiring and bacteria filters. The SCU supplies the PLSS with electrical power, communications, oxygen, waste water drainage, and water cooling from the Orbiter during pre- and post-EVA operations. It also supplies the EMU with recharge of the oxygen tanks, water tanks, and battery.
The vehicle end of the SCU consists of four ECLSS connections and one electrical connector that connects the SCU to the Orbiter service panel. The connections are permanent and do not require crewmember operation.

The common connector on the EMU end of the SCU combines the four fluid and one electrical circuit connector into a single connector operated by the crewmember.

- **EVCS** - The EMU radio is a UHF/AM transceiver installed within the PLSS (reference Figure 4). It provides the following basic functions.
  - Duplex voice communications with another EVA crewmember and the Orbiter
  - Biomedical (ECG) Telemetry via a subcarrier
  - A backup communications mode that provides simplex voice-only communications between the Orbiter and EVA crewmembers

Additionally, the radio provides audible caution and warning tones when cued by the CWS to alert the crewmember in the event of abnormal or unsafe conditions.

The low profile, omnidirectional UHF antenna is mounted in a pocket of the thermal cover on top of the PLSS. It consists of three resonating cavity antennas, one for each of the frequencies used.
Figure 5 - EMU ELECTRICAL INTERFACES
Figure 6 - SOP
Figure 7 - DCM
2. Space Suit Assembly (SSA) - The SSA, reference Figure 8, provides crewmember enclosure for all EVA operations. Containment of the pressurized environment, ventilation and cooling loop support, crewmember mobility and crewmember visibility are the primary functions provided by the SSA. The assemblies and components comprising the SSA are discussed in the following paragraphs.

- HUT and Arms: The hard upper torso includes provisions for the attachment of the helmet/visor, arms, lower torso, PLSS, and DCM. The upper torso consists of a hard torso section, the upper half of the waist ring, the lower half of the helmet neck ring, and the TMG. Integral to the upper torso structure is the channeling for both cooling water circulation and ventilation oxygen circulation. Each arm consists of an upper arm and a lower arm connected by the arm bearing. The upper arm includes the upper torso interfacing scye bearing, a shoulder joint, a conformal bladder, and a TMG. The lower arm includes the glove interfacing wrist disconnect, an elbow joint, a conformal bladder, and a TMG.

- LTA: The lower torso assembly provides coverage for the crewmember from the waist down. It includes a waist bearing, waist section, legs, boots, boot soles, fabric restraint, bladder, and TMG. The top of the lower torso is the lower half of the waist ring, which provides space suit assembly separation for donning, doffing and support for the waist section and hip joints. The redundant axial restraint system transmits loads through all joints from the boots to the lower half of the waist ring.

- Gloves: The EV glove provides protection from both vacuum and temperature extremes for the crewmember's hand. A conformal urethane bladder provides pressure integrity while a polyester cloth restraint system keeps the bladder from deforming when pressurized. A multi-layer insulation (MLI) thermal blanket covers the bladder/restraint system with an Ortho fabric outer layer over the MLI. An adjustable palm restraint bar enables the crewmember to tighten the glove palm area as required for hand mobility.

- Helmet/Visor Assembly: The helmet/visor consists of the helmet bubble and the visor assembly, which are permanently attached. The bubble is a clear rigid pressure-retaining vessel made from UV-stabilized polycarbonate material. Integral to
Figure 8 - SSA
the helmet bubble are the helmet neck ring, which attaches to the upper torso neck ring, and the vent pad, which directs the oxygen flow to the helmet over the crewmember's face for effective carbon dioxide removal. The helmet purge valve is located on the left side of the helmet.

The visor assembly protects the crewmember and helmet from thermal and solar radiation. It consists of visors, pivot and latch mechanisms, center and side eyeshades, and supporting structures for the visors and the shades. The visors are fabricated from UV-stabilized polycarbonate and polysulfane material with thermal/optical coatings applied to the inner surface.

- LCVG: The cooling garment is a form-fitting elastic garment worn against the crewmember's body. The garment supports a network of tubing that circulates cooling water over the body. It also supports a network of ducting that draws ventilating gas from suit extremities to complete the suit ventilation loop. Connections to the ducting in the HUT for both cooling water and vent flows are made at the multiple connector.

- CCA: The comm cap is a fabric skull cap encapsulating microphone and earphone electronic modules.

- UCD: The male UCD is a rubberized fabric bladder worn inside the cooling garment around the waist with a roll-on cuff for interfacing with the crewmember. Urine contained in the UCD may be dumped into the urine tube of the Waste Collection System (WCS). The UCD can contain a maximum of 32 fluid ounces of urine.

3. Caution and Warning System (CWS) - The EMU caution and warning system monitors system configuration, environmental parameters, and consumables status. When detected, faults are displayed to the crewmember automatically. The crewmember can display suit parameters and consumables status at any time. The Shuttle EMU is independent of ground monitoring and control.

The CWS microprocessor is the heart of the EMU CWS and is located on the top side of the PLSS. This box contains the central processing unit, the memory, the analog to digital converters, and the latching relays necessary to processing incoming sensor information and providing it to the crewmember.
3.2 Interfaces and Locations

The EMU interfaces with the Shuttle Orbiter airlock, its mission equipment provisions, and the MMU.

The Orbiter airlock provides stowage for the EMU during launch, orbit, and reentry by means of the EMU mount. The EMU mount serves as the EMU donning and doffing station during EVA preparation and post-EVA operations in the airlock. During EVA prep and post activities, the EMU is connected to the Orbiter Environmental Control and Life Support Subsystem (ECLSS) in the airlock by the SCU for airlock-supplied oxygen, cooling water, communications, and power. Before a second EVA, the EMU is connected to the Orbiter ECLSS by the SCU for EMU recharge. During recharge, the EMU is stowed in the airlock on the EMU mount which serves as a recharge station to permit simultaneous water and oxygen charging, LiOH cartridge replacement, and battery charging or replacement.

The EMU interfaces with crewmember restraint and translation provisions in the airlock and cargo bay. These provisions include handholds, handrails, foot restraints, and tether attachment points.

The Manned Maneuvering Unit (MMU) provides the EVA crewmember a free space maneuvering capability outside the Orbiter cargo bay. The EMU latches to the MMU with the passive half of the latching device provided by the PLSS. The MMU contains the active half of the latching mechanism. Additionally, the MMU support station provides restraints and handrails to aid the EVA crewmember in donning and doffing the MMU.

3.3 Hierarchy

Due to the approach employed by the IOA, the EMU system was analyzed in a hierarchal manner to ensure consistency in fault path definition and in the identification of failure effects. The top level hierarchy employed for EMU analysis considerations is presented in Figure 9.
Figure 9 - EMU HIERARCHY
4.0 ANALYSIS RESULTS

The IOA analysis of the EMU resulted in the identification of 497 failure modes (reference Appendix C) from which 390 PCIs (reference Appendix D) were derived. The summary distributions of failure criticalities and their corresponding PCIs are provided in Tables I and II, respectively.

### TABLE I Summary of IOA Failure Modes and Criticalities

<table>
<thead>
<tr>
<th>Criticality:</th>
<th>1/1</th>
<th>2/1R</th>
<th>2/2</th>
<th>3/1R</th>
<th>3/2R</th>
<th>3/3</th>
<th>TOTAL</th>
</tr>
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<tbody>
<tr>
<td>LSS (Total)</td>
<td>7</td>
<td>187</td>
<td>82</td>
<td>14</td>
<td>93</td>
<td>23</td>
<td>406</td>
</tr>
<tr>
<td>PLSS</td>
<td>2</td>
<td>135</td>
<td>28</td>
<td>9</td>
<td>12</td>
<td>12</td>
<td>198</td>
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<tr>
<td>SOP</td>
<td>4</td>
<td>16</td>
<td>2</td>
<td>-</td>
<td>5</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>SCU</td>
<td>-</td>
<td>2</td>
<td>5</td>
<td>-</td>
<td>27</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>DCM</td>
<td>1</td>
<td>34</td>
<td>47</td>
<td>5</td>
<td>40</td>
<td>9</td>
<td>136</td>
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<td>EVCS</td>
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<td>-</td>
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<td>-</td>
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</tr>
<tr>
<td>C &amp; W</td>
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<td>7</td>
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<tr>
<td>SSA (Total)</td>
<td>4</td>
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<td>34</td>
<td>-</td>
<td>2</td>
<td>10</td>
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<tr>
<td>HUT</td>
<td>3</td>
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<td>7</td>
<td>-</td>
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<td>20</td>
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<tr>
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<tr>
<td>Gloves</td>
<td>-</td>
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<td>-</td>
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<td>9</td>
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<tr>
<td>LTA</td>
<td>-</td>
<td>10</td>
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<td>1</td>
<td>-</td>
<td>1</td>
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<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>11</td>
<td>219</td>
<td>123</td>
<td>14</td>
<td>95</td>
<td>35</td>
<td>497</td>
</tr>
</tbody>
</table>
As is evident, the failure mode and PCI distributions were generally dependent upon hardware complexity and the number of primary functions supported or impacted. These distributions are discussed in detail in the following paragraphs.
4.1 Analysis Results - PLSS

The PLSS analysis identified one hundred and ninety-eight (198) failure modes applicable to its various components and assemblies. Of this number, 90.9% were determined to be PCIs. The two most critical failure modes can result in immediate loss of the crewperson due to an oxygen fire or shrapnel. Because the SOP (discussed in paragraph 4.2) provides redundancy for many of the PLSS functions, one hundred and thirty-five (135) of the 163 mission impact PCI failure modes could be elevated to a possible loss of life if the SOP functions were also failed.

No simple breakdown of failure modes per function was identified; however, during the analysis, the dependency placed upon the SOP by the system design became quite evident. With the exception of the two aforementioned life critical PCI failure modes and twelve failure modes which do not impact PLSS operation in any critical manner, the large majority of the remaining 184 failure modes require unimpaired SOP operation to ensure crewperson survival.

4.2 Analysis Results - SOP

Four single point failures within the SOP can result in loss of crewperson due to an oxygen fire or shrapnel release. Eighteen failure modes can result in mission impact and sixteen of these, given a failure of a non-SOP primary function, can also result in loss of crewperson. The majority of the aforementioned mission impact failure modes typically result in the loss or degradation of the SOP function. When an additional five failure modes (each resulting in mission impact only after an earlier failure) are accounted for and redundancy screens assessed, the total number of PCIs determined within the SOP is twenty-four (24).

4.3 Analysis Results - SCU

Within the analysis the SCU was considered an integral element to several EMU functions (e.g. oxygen delivery, cooling, and environmental maintenance). As such, seven failure modes were identified which, if detected, would result in mission termination; additionally, two of these could result in loss of crewperson during an EVA if a redundant function is also lost. Another twenty-seven failure modes identified were determined capable of impact to the mission with a corresponding loss of redundancy and, of these, only eight failed one or more redundancy screens.

4.4 Analysis Results - DCM

The failure of the DCM pressure gage bourdon tube in a violent manner (ruptures causing an oxygen fire) is the sole DCM PCI which can result in immediate loss of the crewperson. The
remaining DCM PCI failure modes (a total of 93) typically either result in mission impacts or, when combined with loss of redundancy, loss of crewperson or mission. Eighty-one PCIs exist which, if any one occurs, could result in mission termination; however, if combined with corresponding loss of redundant function(s), thirty-four of these could cause the loss of a crewperson. Additionally, a large number of these 81 PCIs result in the inability of the DCM to support either EMU recharge or EMU systems management operations. An additional forty-five (45) failure modes exist which have no impact unless accompanied by loss of redundancy. Of these, five can result in loss of crewperson and forty can result in loss of mission - these often split between loss of EMU recharge or systems management. Application of redundancy screens to these forty-five failure modes result in only 12 being considered PCIs.

4.5 Analysis Results - EVCS

Being the EVCS design provides redundant transmission and reception capabilities no life threatening or mission critical failure modes were identified. However, of the nine failure modes identified, all were considered capable of causing mission termination when loss of redundant EVCS functions were considered. Because all nine of these passed their redundancy screens, none were considered as a PCI.

4.6 Analysis Results - Caution and Warning

Nine failure modes, seven of which are PCIs, can exist in the EMU caution and warning subsystem. The seven PCI failure modes all would result in mission termination either due to erroneous information being provided the crewperson or due to loss of insight into EMU systems operation.

4.7 Analysis Results - HUT

Twenty failure modes were identified applicable to the HUT; eighteen of which are PCIs. The three most critical PCI failure modes result in loss of crewperson due to a gross failure of a HUT interface thereby causing loss of EMU pressure integrity beyond the capability of the SOP. The remaining fifteen PCI failure modes result in mission impact. When eight of these are combined with a corresponding loss of a redundant function - quite often one supported by the SOP, loss of crewperson could result. The other seven PCI failure modes all result in the inability of the HUT to support mission donning/configuration requirements (e.g. unable to mate the helmet to HUT).
4.8 Analysis Results - Helmet

Seven failure modes applicable to the helmet resulted in five PCIs being identified. Each PCI failure mode results in a mission impact. Two of these, if accompanied by a corresponding loss of redundant functions, can also result in loss of crewperson due to loss of pressurization.

4.9 Analysis Results - Arms

Every failure mode (10) applicable to the arms resulted in a PCI. One failure mode could cause loss of a crewperson (by gross depressurization) while the remaining nine would be an immediate mission impact - typically either by loss of mobility, pressure integrity, or don/doff capability. Additionally, the five failure modes which cause degradation or loss of pressure integrity can cause loss of a crewperson if the redundant pressure integrity functions are correspondingly lost.

4.10 Analysis Results - Gloves

The gloves contain nine failure modes and PCIs - all mission impacts. As with the arms, three failure modes, involving loss of degradation of pressure integrity, can result in crewperson loss with loss of redundancies. The remaining PCI failure modes impact the mission by degradation of glove mobility or function during don/doff.

4.11 Analysis Results - LTA

The failure modes applicable to the LTS are similar to those applicable to the HUT and arms. Fifteen failure modes were identified as applicable to the LTS and, upon analysis, thirteen were considered PCIs. None could result in immediate loss of crewperson without corresponding loss of redundant elements; ten of these exist.

4.12 Analysis Results - LCVG

Analysis of the LCVG identified five PCIs. All five result in mission impact and, except for one, can result in loss of crewperson with corresponding loss of redundancy. Those four which can cause loss of crewperson typically cause degradation or loss of the LCVG ventilation or cooling functions.
4.13 Analysis Results - IDB, UCD, and CCA

None of the failures identified as applicable to the IDB, UCD, and CCA are capable of causing loss of life; however, ten (all of which are PCIs) are capable of causing mission termination. Nine IDB and UCD PCI failure modes impact the mission by reducing crewperson comfort and impairment of performance - typically by reduced mobility or vision. The CCA PCI failure mode causes loss of communications and, therefore, the mission.
5.0 REFERENCES

Reference documentation available from NASA was used in the analysis. The documentation used included:

1. NSTS 22206, Instructions for Preparation of Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL), October 10, 1986

2. SVHS 7800, Extravehicular Mobility Unit Design and Performance Requirements Specifications, Rev. M, (no date - last date was Rev. L. 11-26-84)

3. SVHS 10105, CWS Electronics, Design, and Performance Requirements for SEMU Item 150, Rev. A, 5-25-84 (original)

4. SVHS 7801, Environmental Control Equipment, Extravehicular Mobility Unit, General Mechanical Specification for Equipment, Rev. F, (no date)

5. SVHS 7802, Space Shuttle Extravehicular Mobility Unit (EMU) System, General Electrical Requirements for, Rev. A, 3-11-77 (original)

6. SVHS 7808, Specification: Shuttle EMU, SCU and DCM Common Connector (Items 410 and 330), Rev. C, (no date)

7. ICD-HSD-4-0001-0D-0, Space Shuttle EMU/MMU Section I Electrical Interface Document, Rev. L, 2-8-85


9. SV791145, Display, Alphanumeric - Four Character; HSD, Rev. A, 11-7-84

10. SVSK93600, Schematic, Systems Shuttle EMU; HSD, Rev. U, 1-17-86

11. SVSK96170, Schematic, Electrical, DCM; HSD, Rev. B, 3-18-86

12. SV778872, Connector, Multiple; HSD, Rev. Y, 6-17-85

13. SV778596, Switch, Power Mode; HSD, Rev. D, 1-13-84

14. SVSK94600, Schematic, Electrical, DCM; HSD, Rev. AA, 8-10-83

15. SV769939, Valve, Temperature Control; HSD, Rev. K, 11-19-82

16. SV771887, Switch, Fan/CLIV; HSD, Rev. E. 11-19-84

17. SVSK 94002, EMU Wiring Block Diagram; HSD, Rev. N. 12-9-85

27
18. SVSK 107481, Caution and Warning System Block Diagram; HSD, 5-15-84
19. SV767794, Switch, Push to Talk; HSD, Rev. D, 1-24-84
20. SV767795, Switch, Feedwater Valve; HSD, Rev. F, 10-17-84
21. SV767792, Switch, Caution and Warning; HSD, Rev. F, 9-7-85
22. SV767786, Switch, Mode Selector; HSD, Rev. F, 1-24-84
23. SV767789-02, Battery; HSD, Rev. E, 2-11-86
24. SV767789-03, Battery; HSD, Rev. B, 9-26-84
25. SV778528, Sensor, Pressure, Primary Oxygen; HSD, Rev. C, 9-29-83
26. SV767788, Sensor, Differential Pressure; HSD, Rev. J, 4-1-85
27. 0101-10001, Communications Carrier Assembly; ILC, Rev. N, 4-29-85
28. SV778873, Pressure Control Module - Primary; HSD, Rev. V, 11-17-84
29. SV789111, Switch, Sensitive, Hermetic; HSD, Rev. B, 5-27-86
30. SV785844, Relief Valve, Dual Mode - Oxygen Feedwater; HSD, Rev. T, 12-20-84
31. SV771836, Check Valve and Vent Flow Sensor; HSD, Rev. AV, 11-19-84
32. SV787993, Motor, Brushless; HSD, Rev. M, 2-7-86
33. SV772277, Pump, Water; HSD, Rev. R, 8-6-85
34. SV787994, Fan/Separator/Pump Assembly; HSD, Rev. J, 2-7-86
35. SV769480, Valve, Pilot Actuated; HSD, Rev. N, 5-30-85
36. SV784996, Valve, Check; HSD, Rev. B, 4-27-83
37. SV778543, Filter, Pump Inlet; HSD, Rev. H, 7-17-85
38. SV767699, Valve, Check, Assembly; HSD, 9-6-77
39. SV769403, Valve, Relief Condensate Water; HSD, Rev. N, 5-16-85
40. SV784943, Trap, Gas; HSD, Rev. E, 10-30-84
41. SV769405, Valve, Relief, Water; HSD, Rev. J, 10-4-82
42. SV785860, Valve, Relief; HSD, Rev. H, 11-20-84
43. SV787036, Valve, Positive Relief; HSD, Rev. G, 12-14-84
44. SV85927, Valve, Negative Relief; HSD, Rev. A, 11-19-84
45. SV85970, Box Assy., Caution and Warning; HSD, Rev. N, 12-20-85
46. SV784982, Valve, Isolation; HSD, Rev. F, 6-20-85
47. SV784998, Valve Assy., Coolant Isolation; HSD, Rev. E, 4-15-85
48. SV784985, Valve, Coolant Relief; HSD, Rev. D, 12-4-82
49. ICD-HSD-4-0001-OD-0, EMU-MMU Interface (Section II); HSD, Rev. L, 2-8-85
50. ICD-HSD-4-0008-OC, Figure 6, EVC Envelope Requirement; HSD, Rev. G, 12-13-83
51. SV789152, Harness, Electrical Signal; HSD, Rev. R, 6-24-86
52. SV789151, Harness, Electrical Power, HSD, Rev. AD, 6-30-86
53. SV767710-07, Secondary Oxygen Pack; HSD, Rev. V, 7-13-85
54. SV778475, Pressure Control Module, Secondary; HSD, Rev. T, 7-2-85
55. SV792294-01, Module, Display and Control; HSD, 6-27-86
56. SV767690-02, Harness, EMU, Electrical; HSD, Rev. F, 12-10-85
57. SV772910, Regulator, Pressure, Water Supply; HSD, Rev. L, 8-20-84
58. SV771717, Regulator, Condensate Water; HSD, Rev. M, 11-8-82
59. SV778865, Hose Assy., SCU; HSD, Rev. F, 8-15-84
60. SV767730-09, Umbilical, Service and Cooling; HSD, 8-8-85
61. SV767785, Potentiometer, Display Intensity; HSD, Rev. F, 2-22-84
62. SV767784, Potentiometers, Volume Control; HSD, Rev. F, 2-23-84
63. SV771763, Harness Assy., Electrical; HSD, Rev. ABH, 6-30-86
64. SV771749, Sheath Assy.; HSD, Rev. H, 2-8-84
65. SV778872, Connector, Multiple; HSD, Rev. Y, 6-17-86
66. SV787027, Purge Valve - DCM; p HSD, Rev. C, 10-9-85
67. SV792291, Electronic Assy., DCM; HSD, Rev. H, 6-21-86
68. SV785003, Connector, Electrical, SCU; HSD, 7-21-82
69. SV764255, Connector, Electrical, Circular; HSD, Rev. J, 8-30-78
70. SV789153, Harness, Electrical, Caution and Warning; HSD, Rev. V, 6-30-85
71. SV779301, Manifold Assy., Oxygen, Water; HSD, Rev. F, 12-9-85
72. SV778540, Shear Plate Assy.; HSD, Rev. BU, 5-27-86
73. 0102-82437-18, ILC Dover, Table of Operations, Waterline/Vent Tube Assembly, 5-14-86
74. 9693, Assembly Multiple Connector LCVS Side, Air-Lock, Inc., Rev. D, 3-17-83
75. 9697, Assembly Three Hose Clamp, Air-Lock, Inc., Rev. D, 3-17-83
76. 9357, Helmet-to-Suit Disconnect Assembly Suit Side, Air-Lock, Inc., Rev. Q, 3-17-83
77. 9715, Helmet Ventseal Assembly, Air-Lock, Inc., Rev. D, 3-17-83
78. 0107-82568-09, Table of Operations, Vent Plenum Assembly, ILC Dover, Rev. A, October 1985
79. 0107-81057-19/20, Table of Operations, Boot/Leg Vent Duct, ILC Dover, July 1986
80. 0107-81060-08, Table of Operations, LCVG Hand Vent/Arm Duct, ILC Dover, Rev. A, September 1985
81. 0104-82403-29/30, Table of Operations, Pressure Boot Assembly, ILC Dover, Rev. B, September 1985
82. 9752, Boot Disconnect Assembly, Air-Lock, Inc., Rev. B, 5-16-83
83. 9787, Assembly Body Seal Closure LTA Half (16" Inside), Air-Lock, Inc., Rev. F, 5-16-83
84. 0106-86059-01, Table of Operations, Palm Restraint Assembly, Glove Modified, ILC Dover, Rev. IR, March 1986
85. 0106-23421, Bar, Palm Restraint, ILC Dover, Rev. E, 6-27-83
86. 9924, Wrist Disconnect Assembly Glove Side-Right Hand, Large (3.680 ID), Air-Lock, Inc., Rev. C, 7-26-84
87. 9814, Wrist Disconnect Assembly Suit SIDE-RH, Air-Lock, Inc., Rev. F, 6-12-86
88. 9782, Assembly SCYE Bearing, 8.710 Ball Circles Dia., Air-Lock, Inc., Rev. E
89. 9813, Wrist Disconnect Assembly Suite Side-LH, Air-Lock, Inc., Rev. F, 6-12-86
90. 9819, Combination Purge Vent Assembly, Air-Lock, Inc., Rev. R, 5-17-83
92. 9786, Body Seal Closure Hut Half, 16" Inside, Air-Lock, Inc., Rev. D, 5-12-83
93. SV772302, Retainer and Inserts, Bearing Shoulder, HSD, Rev. M, 1-10-80
94. SV772303, Support, Pivot-Shoulder Bearing, HSD, Rev. E, 7-9-82
96. 9694, Assembly Multiple Connector, Hut Side, Air-Lock, Inc., Rev. J, 5-2-86
97. SV772375, Shell and Inserts, Large-Hard Torso, HSD, 10-9-78
## APPENDIX A
### ACRONYMS

<table>
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<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAP</td>
<td>Airlock Adapter Plate</td>
</tr>
<tr>
<td>BITE</td>
<td>Built-in Test Equipment</td>
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<tr>
<td>CCA</td>
<td>Communications Carrier Assembly</td>
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<tr>
<td>CCC</td>
<td>Contaminant Control Cartridge</td>
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<tr>
<td>COMM</td>
<td>Communication</td>
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<tr>
<td>CPU</td>
<td>Central Processing Unit</td>
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<td>CWS</td>
<td>Caution and Warning System</td>
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<td>C&amp;W</td>
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<td>DCM</td>
<td>Display and Control Module</td>
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<td>EVCS</td>
<td>Extravehicular Communications System</td>
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<tr>
<td>ECLSS</td>
<td>Environmental Control and Life Support System</td>
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<td>EMU</td>
<td>Extravehicular Activity</td>
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<tr>
<td>EVA</td>
<td>Extravehicular Activity</td>
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<tr>
<td>EVC</td>
<td>Extravehicular Communicator</td>
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<td>EVVA</td>
<td>Extravehicular Visor Assembly</td>
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<td>EVCS</td>
<td>Extravehicular Communications System</td>
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<td>FM</td>
<td>Failure Mode</td>
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<td>GFE</td>
<td>Government Furnished Equipment</td>
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<td>HSD</td>
<td>Hamilton Standard</td>
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<tr>
<td>HUT</td>
<td>Hard Upper Torso</td>
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<tr>
<td>IOA</td>
<td>Independent Orbiter Assessment</td>
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<tr>
<td>IDB</td>
<td>Insuit Drink Bag</td>
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<tr>
<td>IVA</td>
<td>Intravehicular Activity</td>
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<tr>
<td>LCVG</td>
<td>Liquid Cooling and Vent Garmet</td>
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<tr>
<td>LiOH</td>
<td>Lithium Hydroxide</td>
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<tr>
<td>LSS</td>
<td>Life Support System</td>
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<tr>
<td>LTA</td>
<td>Lower Torso Assembly</td>
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<td>MMU</td>
<td>Manned Maneuvering Unit</td>
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<tr>
<td>OPS</td>
<td>Operations</td>
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<tr>
<td>PLSS</td>
<td>Primary Life Support Subsystem</td>
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<td>SCU</td>
<td>Service and Cooling Umbilical</td>
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<td>SOP</td>
<td>Secondary Oxygen Pack</td>
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<td>SSA</td>
<td>Space Suite Assembly</td>
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<tr>
<td>STS</td>
<td>Space Transportation System</td>
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<tr>
<td>UCD</td>
<td>Urine Collection Device</td>
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APPENDIX B

DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.1 Definitions
B.2 Project Level Ground Rules and Assumptions
B.3 Subsystem-Specific Ground Rules and Assumptions
APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.1 Definitions

Definitions contained in NSTS 22206, Instructions For Preparation of FMEA/CIL, 10 October 1986, were used with the following amplifications and additions.

INTACT ABORT DEFINITIONS:

RTLS - begins at transition to OPS 6 and ends at transition to OPS 9, post-flight

TAL - begins at declaration of the abort and ends at transition to OPS 9, post-flight

AOA - begins at declaration of the abort and ends at transition to OPS 9, post-flight

ATO - begins at declaration of the abort and ends at transition to OPS 9, post-flight

CREDIBLE (CAUSE) - an event that can be predicted or expected in anticipated operational environmental conditions. Excludes an event where multiple failures must first occur to result in environmental extremes

CONTINGENCY CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

EARLY MISSION TERMINATION - termination of onorbit phase prior to planned end of mission

EFFECTS/RATIONALE - description of the case which generated the highest criticality

HIGHEST CRITICALITY - the highest functional criticality determined in the phase-by-phase analysis

MAJOR MODE (MM) - major sub-mode of software operational sequence (OPS)

MC - Memory Configuration of Primary Avionics Software System (PASS)

MISSION - assigned performance of a specific Orbiter flight with payload/objective accomplishments including orbit phasing and altitude (excludes secondary payloads such as GAS cans, middeck P/L, etc.)
MULTIPLE ORDER FAILURE - describes the failure due to a single cause or event of all units which perform a necessary (critical) function.

OFF-NOMINAL CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards.

OPS - software operational sequence.

PRIMARY MISSION OBJECTIVES - worst case primary mission objectives are equal to mission objectives.

PHASE DEFINITIONS:

PRELAUNCH PHASE - begins at launch count-down Orbiter power-up and ends at moding to OPS Major Mode 102 (liftoff).

LIFTOFF MISSION PHASE - begins at SRB ignition (MM 102) and ends at transition out of OPS 1 (Synonymous with ASCENT).

ONORBIT PHASE - begins at transition to OPS 2 or OPS 8 and ends at transition out of OPS 2 or OPS 8.

DEORBIT PHASE - begins at transition to OPS Major Mode 301 and ends at first main landing gear touchdown.

LANDING/SAFING PHASE - begins at first main gear touchdown and ends with the completion of post-landing safing operations.
B.2 IOA Project Level Ground Rules and Assumptions

The philosophy embodied in NSTS 22206, Instructions for Preparation of FMEA/CIL, 10 October 1986, was employed with the following amplifications and additions.

1. The operational flight software is an accurate implementation of the Flight System Software Requirements (FSSRs).

   RATIONALE: Software verification is out-of-scope of this task.

2. After liftoff, any parameter which is monitored by system management (SM) or which drives any part of the Caution and Warning System (C&W) will support passage of Redundancy Screen B for its corresponding hardware item.

   RATIONALE: Analysis of on-board parameter availability and/or the actual monitoring by the crew is beyond the scope of this task.

3. Any data employed with flight software is assumed to be functional for the specific vehicle and specific mission being flown.

   RATIONALE: Mission data verification is out-of-scope of this task.

4. All hardware (including firmware) is manufactured and assembled to the design specifications/drawings.

   RATIONALE: Acceptance and verification testing is designed to detect and identify problems before the item is approved for use.

5. All Flight Data File crew procedures will be assumed performed as written, and will not include human error in their performance.

   RATIONALE: Failures caused by human operational error are out-of-scope of this task.
6. All hardware analyses will, as a minimum, be performed at the level of analysis existent within NASA/Prime Contractor Orbiter FMEA/CILs, and will be permitted to go to greater hardware detail levels but not lesser.

RATIONAL: Comparison of IOA analysis results with other analyses requires that both analyses be performed to a comparable level of detail.

7. Verification that a telemetry parameter is actually monitored during AOS by ground-based personnel is not required.

RATIONAL: Analysis of mission-dependent telemetry availability and/or the actual monitoring of applicable data by ground-based personnel is beyond the scope of this task.

8. The determination of criticalities per phase is based on the worst case effect of a failure for the phase being analyzed. The failure can occur in the phase being analyzed or in any previous phase, whichever produces the worst case effects for the phase of interest.

RATIONAL: Assigning phase criticalities ensures a thorough and complete analysis.

9. Analysis of wire harnesses, cables, and electrical connectors to determine if FMEAs are warranted will not be performed nor FMEAs assessed.

RATIONAL: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

10. Analysis of welds or brazed joints that cannot be inspected will not be performed nor FMEAs assessed.

RATIONAL: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

11. Emergency system or hardware will include burst discs and will exclude the EMU Secondary Oxygen Pack (SOP), pressure relief valves and the landing gear pyrotechnics.

RATIONAL: Clarify definition of emergency systems to ensure consistency throughout IOA project.
B.3 EMU Ground Rules and Assumptions

1. The overall EMU mission will encompass both planned EVA operations (typically two 2-man EVAs are available each Orbiter mission) and unscheduled EVA operations (typically reserved for Orbiter safety-critical EVA tasks).

   RATIONALE: Ensures analysis provides worst-case mission impact.

2. The inability of an EMU to perform an EVA or to satisfy a six-hour EVA duration will be considered a mission impact.

   RATIONALE: A worst case scenario in which the EMU is employed for prebreathe, or in which the EVA is time critical (e.g. rescue of stranded EVA crewmember), or in which the EVA objectives require full EVA duration is thus obtained for the IOA analysis.
APPENDIX C
DETAILED ANALYSIS

This section contains the IOA analysis worksheets generated during the analysis of this subsystem. The information on these worksheets is intentionally similar to the NASA FMEAs. Each of these sheets identifies the hardware item being analyzed, and parent assembly, as well as the function. For each failure mode, the possible causes are outlined, and the assessed hardware and functional criticality for each mission phase is listed, as described in the NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. Finally, effects are entered at the bottom of each sheet, and the worst case criticality is entered at the top.

LEGEND FOR IOA ANALYSIS WORKSHEETS

-----------------------------------

Hardware Criticalities:
1 = Loss of life or vehicle
2 = Loss of mission or next failure of any redundant item
    (like or unlike) could cause loss of life/vehicle
3 = All others

Functional Criticalities:
1R = Redundant hardware items (like or unlike) all of which,
    if failed, could cause loss of life or vehicle.
2R = Redundant hardware items (like or unlike) all of which,
    if failed, could cause loss of mission.

Redundancy Screen A:
1 = Is Checked Out PreFlight
2 = Is Capable of Check Out PreFlight
3 = Not Capable of Check Out PreFlight
NA = Not Applicable

Redundancy Screens B and C:
P = Passed Screen
F = Failed Screen
NA = Not Applicable
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM:  EMU  FLIGHT:  2/1R
MDAC ID:  100

ITEM: PRIMARY H2O TANK 1 (ITEM 131)
FAILURE MODE: BLADDER FAILURE (02/H2O)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
5)
6)
7)
8)
9)

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA:  2/2
EVA:  2/1R
POST-EVA:  2/2


LOCATION:
PART NUMBER: SV769592-24

CAUSES: MATERIAL DEFECT, EXCESSIVE WEAR, BLADDER SEAL FAILURE

EFFECTS/RATIONALE:
02 AND H2O MIX IN FDW TANK DURING EVA WITH PROBABLE
DEGRADATION/LOSS OF COOLING DUE TO INEFFECTIVE H2O FLOW TO
SUBLIMATOR; THEREFORE, LOSS OF CREWPERSON IF SOP ALSO FAILS.
UNABLE TO OBTAIN HYRAULIC LOCK-UP DURING FILL/RECHARGE—WOULD LEAK
INTO THE GAS SIDE. EXCESS H2O USAGE DURING CHARGE WOULD INDICATE
LEAK. UNDETECTED, H2O ON THE GAS SIDE COULD MIGRATE (VIA THE
120A ORIFICE) TO THE SUIT WHERE IT WOULD THREATEN USE OF THE
PURGE VALVE BY H2O FREEZING AND BLOCKING IT DURING EVA WHEN LOSS
OF COOLING WOULD REQUIRE EMERGENCY SOP USE.

REFERENCES:

REPORT DATE 12/02/86  C-2
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 101

ITEM: PRIMARY H2O TANK 1 (ITEM 131)
FAILURE MODE: LEAK-02 SIDE EXTERNAL

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
5)
6)
7)
8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE, VIBRATION

EFFECTS/RATIONALE:
DURING PRE- AND POST-EVA, 02 SIDE IS NOT PRESSURIZED EXCEPT
DURING PORTIONS OF DONNING AND DOFFING SEQUENCES. DURING EVA AND
PRE- AND POST-EVA TIMEFRAMES WHEN 02 PRESSURIZATION EXISTS,
LEAKAGE WOULD RESULT IN MISSION IMPACT AND LOSS OF PRIMARY 02
SUPPLY REQUIRING, IF EVA, SOP USAGE. LOSS OF SOP CAN RESULT IN
LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86  C-3
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 102

ITEM: PRIMARY H2O TANK 1 (ITEM 131)
FAILURE MODE: LEAK-H2O SIDE, EXTERNAL (OR VIA TPJ)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE, CORROSION

EFFECTS/RATIONALE:
LOSS OF H2O RESULTS IN THE INABILITY TO OBTAIN ACCEPTABLE FILL/RECHARGE AND THEREFORE LOSS OF MISSION. H2O LOSS DURING EVA RESULTS IN LOSS/DEGRADATION OF COOLING VIA SUBLIMATOR WITH POSSIBLE USAGE OF SOP REQUIRED TO RETURN CREWPERSON TO VEHICLE. WITH LOSS OF SOP, POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86  C-4
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/1R
MDAC ID: 103

ITEM: PRIMARY H2O TANK 1 (ITEM 162)
FAILURE MODE: BLADDER FAILURE (02/H2O)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769592-24

CAUSES: MATERIAL DEFECT, EXCESSIVE WEAR, BLADDER SEAL FAILURE

EFFECTS/RATIONALE:
02 AND H2O MIX IN FDW TANK. UNABLE TO OBTAIN HYDRAULIC LOCK-UP DURING FILL/RECHARGE. H2O WOULD LEAK INTO GAS SIDE AND EXCESS H2O USE WOULD INDICATE LEAK. UNDETECTED, THIS H2O ON THE GAS SIDE COULD MIGRATE (VIA THE 120A ORIFICE) TO THE SUIT WHERE IT WOULD THREATEN USE OF THE PURGE VALVE BY H2O FREEZING AND BLOCKING IT DURING EVA WHEN LOSS OF COOLING REQUIRES SOP USAGE.

REFERENCES:

REPORT DATE 12/02/86 C-5
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 104

ITEM: PRIMARY H2O TANK 1 (ITEM 162)  HDW/FUNC
FAILURE MODE: LEAK-02 SIDE, EXTERNAL

LEAD ANALYST: G. RAFFAELLI    SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) FLSS
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CRITICALITIES
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LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
DURING PRE- AND POST-EVA, O2 SIDE IS NOT PRESSURIZED EXCEPT
DURING PORTIONS OF DONNING AND DOFFING SEQUENCES. DURING EVA,
AND THESE PRE- AND POST-EVA TIMEFRAMES WHEN O2 PRESSURIZATION
EXIST, LEAKAGE WOULD RESULT IN MISSION IMPACT AND LOSS OF PRIMARY
O2 SUPPLY REQUIRING, IF EVA, SOP USAGE. POSSIBLE CREWPERSON LOSS
IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-6
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 105

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRIMARY H2O TANK 1 (ITEM 162)
FAILURE MODE: LEAK-H2O SIDE, EXTERNAL (AND/OR VIA TPK)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O RESULTS IN INABILITY TO PERFORM ACCEPTABLE
FILL/RECHARGE AND THEREFORE LOSS OF MISSION. H2O LOSS DURING EVA
RESULTS IN LOSS/DEGRADATION OF COOLING VIA SUBLIMATOR WITH
POSSIBLE REQUIRED USAGE OF SOP TO RETURN CREW PERSON TO VEHICLE.
IF THE SOP FAILS THE CREW PERSON COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86 C-7
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86            HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU          FLIGHT: 2/1R
MDAC ID: 106

ITEM: RESERVE H2O TANK (ITEM 148)
FAILURE MODE: BLADDER FAILURE (02/H2O MIX)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV769592-24

CAUSES: MATERIAL DEFECT, EXCESSIVE WEAR, BLADDER SEAL FAILURE

EFFECTS/RATIONALE:
02 AND H2O MIX IN FDW TANK. UNABLE TO OBTAIN HYDRAULIC LOCK-UP
DURING FILL/RECHARGE-H2O THEN LEAK INTO THE GAS SIDE. EXCESS H2O
FOR FILL WOULD INDICATE LEAK. UNDETECTED, THIS H2O ON THE GAS
SIDE COULD MIGRATE (VIA THE 120A ORIFICE) TO THE SUIT WHERE IT
WOULD THREATEN USE OF THE PURGE VALVE BY H2O FREEZING AND
BLOCKING IT DURING EVA WHEN LOSS OF COOLING WOULD REQUIRE SOP
USAGE.

REFERENCES:

REPORT DATE 12/02/86 C-8
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 107

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: RESERVE H2O TANK (ITEM 148)
FAILURE MODE: LEAK-02 SIDE, EXTERNAL

LEAD ANALYST: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
DURING PRE- AND POST-EVA, 02 SIDE IS NOT PRESSURIZED EXCEPT DURING PORTIONS OF DONNING AND DOFFING SEQUENCES. DURING EVA, AND THOSE PRE- AND POST-EVA TIMEFRAMES WHEN 02 PRESSURIZATION EXISTS, LEAKAGE WOULD RESULT IN MISSION IMPACT DUE TO LOSS OF PRIMARY 02 REQUIRING USE OF SOP IF EVA. IF SOP WERE FAILED THE CREWPERSON COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86 C-9
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 108

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: RESERVE H20 TANK (ITEM 148)
FAILURE MODE: LEAK-H20 SIDE, EXTERNAL (AND/OR VIA TPC OR TPL)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769592-24

CAUSES: CORROSION, SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H20 RESULTS IN FLOW FROM ALL TANKS UNTIL COOLING IS DEGRADED/LOST REQUIRING MISSION TERMINATION. IF EVA, MISSION TERMINATION MAY REQUIRE SOP USAGE TO RETURN TO VEHICLE. LOSS OF CREWPERSON COULD RESULT WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-10
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 109

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: BIASED HIGH (OR FAILED HIGH)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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9) 

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767793-5/SV767793-7

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING

EFFECTS/RATIONALE:
PRE- OR POST-EVA WILL NOT BE ABLE TO ENSURE APPROPRIATE H2O FILL AVAILABLE AND WILL IMPACT C&W-MISSION IMPACT; ALSO, THE AIRLOCK HAS AN H2O GAGE TO COMPARE TO. IF EVA, CREWMEMBER WILL NOT BE FOREWARNED OF "PREMATURE" H2O DEPLETION, BUT CAN USE SUBLIMATER PRESSURE (ITEM 138) TO INDICATE SOP REQUIRED. ADDITIONALLY THE H2O SUPPLY IS ADEQUATE FOR A NORMAL MISSION LENGTH WHICH IS TIMED AND PROVIDED TO THE CREWPERSON. FAILURE OF THESE REDUNDANCIES WOULD RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-11
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 110

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: BIASED LOW (OR FAILED LOW)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767793-5/SV767793-7

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING, LOSS OF
REFERENCE PRESSURE INTEGRITY-BELLOWS LKG, LOSS OF POWER (SEE
BATTERY FAILURE)-OPEN

EFFECTS/RATIONALE:
PRE- AND POST-EVA WILL NOT BE ABLE TO ENSURE APPROPRIATE H2O FILL
AVAILABLE AND WILL IMPACT C&W-MISSION IMPACT. (THE AIRLOCK HAS
AN H2O GAGE TO COMPARE TO). IF EVA, CREWMEMBER WILL NOT BE FULLY
AWARE OF H2O USAGE. POSSIBLE SOP USAGE REQUIRED IF H2O
USE RATE GREATER THAN NORMAL AND/OR LEAK EXISTS.

REFERENCES:

REPORT DATE 12/02/86 C-12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 111

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: EXTERNAL H2O LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767793-5/SV767793-7

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL H2O LOSS UNTIL IMPACT TO CREWMEMBER COOLING. POSSIBLE SOP USAGE, IF EVA. LOSS OF CREWPERSON POSSIBLE IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-13
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 112

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: INTERNAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
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8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767793-5/SV767793-7

CAUSES: VIBRATION, FAILURE OF INSULATION, CONTAMINATION

EFFECTS/RATIONALE:
PROBABLE ERRONEOUS READING OF PRESSURE. CURRENT LIMITED IN THE
DCM. DECREASES BATTERY RESERVE AVAILABLE. IF EVA, CREWMEMBER
MAY GET ERRONEOUS C&W MESSAGES OR BE DEPRIVED OF ACCURATE C&W.
EARLY POWER LOSS OR ERRONEOUS C&W CAN RESULT IN SOP BEING USED IF
MISSION NOT TERMINATED. CREWPERSON LOSS CAN RESULT IF SOP IS
ALSO FAILS WHEN USED.

REFERENCES:

REPORT DATE 12/02/86 C-14
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 113

ITEM: WATER RELIEF VALVE (ITEM 142)
FAILURE MODE: INTERNAL LKG/FAIL OPEN (PRIMARY TANKS TO RESERVE AND VICE VERSA)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PISS
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CRITICALITIES

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<td>POST-EVA:</td>
<td>3/2R</td>
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LOCATION: 
PART NUMBER: SV769405-3

CAUSES: SEAL FAILURE, MECHANICAL FAILURE UNABLE TO RESEAT-SPRING FRACTURE, CRACK PRESSURE LOW

EFFECTS/RATIONALE:
THIS WILL CAUSE ALL TANKS TO DEPLETE AS ONE. CREWMEMBER WILL BE UNAWARE OF RESERVE TANK USAGE. HOWEVER, THIS WILL NOT IMPACT THE USE RATE OF FEEDWATER; RATHER, IT MAY ALLOW FOR CREWMEMBER, DURING HIGH HEAT-LOAD MISSIONS, TO OVEREXTEND BEYOND AVAILABLE FEEDWATER SUPPLY AND COOLING WITHOUT WARNING; THEREBY REQUIRING SOP USAGE IN AN UNPLANNED MANNER. ADDITIONALLY, A MISSION CLOCK IS AVAILABLE FOR THE EVA CREWMEMBER. FAILURE OF REDUNDANT SOP ELEMENT CAN RESULT IN LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-15
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 114

ITEM: WATER RELIEF VALVE (ITEM 142)
FAILURE MODE: FAILURE TO OPEN/FAIL CLOSED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769405-3

CAUSES: MECHANICAL FAILURE—UNABLE TO OPEN DUE BEING TO STUCK IN SEAT OR SPRING FAILURE

EFFECTS/RATIONALE:
TOTAL FEEDWATER QUANTITY NOW REDUCED BY .9 LBS. THIS CAN RESULT IN EARLY MISSION TERMINATION AND LOSS OF FULL COOLING CAPABILITY VIA SUBLIMATOR. SOP USAGE MAY BE REQUIRED. UNABLE TO DRAIN RESERVE TANK. POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP.

REFERENCES:

REPORT DATE 12/02/86  C-16
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 115
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: WATER RELIEF VALVE (ITEM 142)
FAILURE MODE: EXTERNAL LKG

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769405-3

CAUSES: SEAL FAILURES

EFFECTS/RATIONALE:
LOSS OF FEEDWATER WILL DEGRADE CAPABILITY TO COOL CREWMEMBER AND MAY RESULT IN USE OF SOP IN ADDITION TO MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-17
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 116

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/1R

ITEM: WATER CHECK VALVE (ITEM 143)
FAILURE MODE: INTERNAL LKG (FROM RESERVE TO PRI)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/1R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV769406-2

CAUSES: INTERNAL SEAT/SEAL FAILURE—WEAR OR CONTAMINATION, SPRING FAILURE/FRACTURE

EFFECTS/RATIONALE:
THIS WILL CAUSE ALL TANKS TO DEPLETE AS ONE. THE CREWMEMBER WILL BE UNAWARE OF RESERVE TANK USAGE UNTIL ALL FDW DEPLETED. THIS WILL NOT IMPACT FEEDWATER USE RATE. A MISSION CLOCK IS AVAILABLE TO CREWMEMBER TO INDICATE TYPICAL MISSION DURATION. FOR HIGH HEAT LOAD OR NONTYPICAL MISSIONS, THE CREWMEMBER CAN POSSIBLY BE SUBJECT TO LOSS OF COOLING THEREBY REQUIRING POSSIBLE SOP USAGE. POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-18
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 117

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: WATER CHECK VALVE (ITEM 143)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION: SV769406-2

CAUSES: MECHANICAL FAILURE MAINTAINS SEAL, SPRING
FAILURE/FRACTURE

EFFECTS/RATIONALE:
UNABLE TO CHARGE/RECHARGE RESERVE H2O TANK THEREBY IMPACTING MISSION. (DETECTION OF PROBLEM BY H2O QUANTITY USED FOR FILL.) IF UNDETECTED BY WATER MANAGEMENT, EVA CREWMEMBER MAY BE SUBJECT TO PREMATURE LOSS OF COOLING AND REQUIRE THE SOP TO RETURN TO THE VEHICLE. LOSS OF CREWPERSON WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-19
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 118

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: WATER CHECK VALVE (ITEM 143)
FAILURE MODE: EXTERNAL LEAKAGE (RESERVE TANK SIDE OR PRIMARY TANK SIDE)

LEAD ANALYST: G. RAFFAELEI
SUBSYS LEAD: G. RAFFAELEI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769406-2

CAUSES: SEAL FAILURE AND CONNECTOR

EFFECTS/RATIONALE:
LOSS OF FEEDWATER RESULTS IN MISSION TERMINATION AND POSSIBLE USE OF SOP FOR COOLING IF EVA. POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-20
ITEM: FEEDWATER PRESSURE REGULATOR (ITEM 136)
FAILURE MODE: REGULATES HIGH (BIASED OR FULL OPEN)

LEAD ANALYST: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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8)
9)

CRITICALITIES

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LOCATION:
PART NUMBER: SV792528-3

CAUSES: MECHANICAL FAILURE-RESISTANT SPRING FAILURES, PISTON/PLUNGER STICKS OPEN, CONTAMINATION ON SEAL

EFFECTS/RATIONALE:
PROBABLE SUBLIMATOR FEEDWATER BREAKTHROUGH AND LOSS OF COOLING WHEN EVA. DETECTABLE VIA PRESSURE SENSOR ITEM 138. SOP WILL PROVIDE REDUNDANT COOLING. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS DURING EVA.

REFERENCES:

REPORT DATE 12/02/86 C-21
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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**ITEM:** FEEDWATER PRESSURE REGULATOR (ITEM 136)

**FAILURE MODE:** REGULATES LOW (BIASED OR FULL CLOSED)

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**

1) EMU  
2) LSS  
3) PLSS  
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**CRITICALITIES**

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**REDUNDANCY SCREENS:**  
A [2]  
B [P]  
C [P]

**LOCATION:**  
PART NUMBER: SV792528-3

**CAUSES:** PRESSURE REF. FAILURE, CONTAMINATION IS BLOCKING INTERNAL FLOW PATH, FILTER BLOCKED

**EFFECTS/RATIONALE:**  
LOW PRESSURE REGULATION RESULTS IN DEGRADED COOLING, MISSION TERMINATION, AND POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

**REFERENCES:**

**REPORT DATE 12/02/86**  
C-22
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 121

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE REGULATOR (ITEM 136)
FAILURE MODE: INTERNAL LKG.

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV792528-3

CAUSES: SEAT FAILURE/SEAL FAILURE

EFFECTS/RATIONALE:
ASSUMING EVA WITH THE ISOLATION VALVE OPEN, PROBABLE SUBLIMATOR FEEDWATER BREAKTHROUGH AND SUBSEQUENT LOSS OF COOLING. SOP USAGE POSSIBLE. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED. IF IN AIRLOCK PRE- OR POST-EVA, MISSION IS TERMINATED IF SUBLIMATOR SHUTOFF VALVE FAILS OPEN.

REFERENCES:

REPORT DATE 12/02/86  C-23
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY   HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 122

ITEM: FEEDWATER PRESSURE REGULATOR (ITEM 136)
FAILURE MODE: EXTERNAL LKG.

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV792528-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FEEDWATER SUPPLY WITH DEGRADATION/LOSS OF COOLING VIA
SUBLIMATOR. SOP USAGE POSSIBLE IF EVA. POSSIBLE LOSS OF
CREWPERSON IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-24
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 123
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER RELIEF VALVE (ITEM 135)
FAILURE MODE: INTERNAL LKG. - FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
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7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769404-6

CAUSES: INTERNAL PLUNGER/DIAPHRAM FAILS MECHANICALLY OPEN,
CONTAMINATION BLOCKS SEAT OPEN

EFFECTS/RATIONALE:
LOSS OF H2O FDW SUPPLY FOR SUBLIMATOR. DEGRADATION-COOLING LOSS
TO CREWMEMBER. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF
CREWPERSON IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-25
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 124

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER RELIEF VALVE (ITEM 135)
FAILURE MODE: EXTERNAL LKG - FDW. SIDE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV769404-6

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O FDW SUPPLY FOR SUBLIMATOR. DEGRADATION COOLING LOSS TO CREWMEMBER. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-26
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 9/26/86  
**SUBSYSTEM:** EMU  
**MDAC ID:** 125

**ITEM:** FEEDWATER RELIEF VALVE (ITEM 135)  
**FAILURE MODE:** FAILS TO OPEN

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU  
2) LSS  
3) PLSS

**CRITICALITIES**

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**REDUNDANCY SCREENS:**  
A [2]  
B [F]  
C [P]

**LOCATION:**  
**PART NUMBER:** SV769404-6

** CAUSES:** PLUNGER MECHANICAL FAILURE; BLOCKED DUE TO CONTAMINATION, DIAPHRAM FAILURE

**EFFECTS/RATIONALE:**
FOR A FAILURE TO OPEN SCENARIO, ONE MUST ASSUME OVER-PRESSURIZATION IN THE FWD TANKS EXISTS DUE TO THERMAL EXPANSION. THIS CAN NOT OCCUR DURING EVA DUE TO EVA USAGE OF H2O VIA SUBLIMATOR. PRE- AND POST-EVA, THIS FAILURE CAN RESULT IN DAMAGE TO SEALS, BLADDERS, AND OTHER SYSTEM COMPONENTS; THEREBY REQUIRING MISSION TERMINATION IF DETECTED.

**REFERENCES:**

**REPORT DATE 12/02/86**  
**C-27**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 126

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV767660-5

CAUSES: INTERNAL SEAL FAILURES, VALVE POPPET UNABLE TO FULLY
SEAT DUE TO CONTAMINATION AND/OR SEAT WEAR

EFFECTS/RATIONALE:
PRESSURE READOUT AT ITEM 138 WILL DETECT INTERNAL LEAKAGE WHEN
VALVE IS CLOSED. LEAKAGE PRE- OR POST-EVA WILL DEplete THE
RESERVOIR OF H20 VIA THE SUBLIMATOR. MISSION TERMINATION
REQUIRED DUE TO FLOODED SUBLIMATOR.

REFERENCES:

REPORT DATE 12/02/86 C-28
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 127

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: EXTERNAL LEAKAGE (EITHER SIDE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV767660-5

CAUSES: SEAL FAILURE - INLET, OUTLET, OR HOUSING

EFFECTS/RATIONALE:
LEAKAGE DURING EVA WILL DEplete H2O RESERVOIRS AND CAUSE LOSS OF COOLING VIA SUBLIMATOR. MISSION TERMINATION REQUIRED WITH POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-29
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 128

HIGHEST CRITICALITY: HDW/FUNC

FLIGHT: 2/1R

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767660-5

CAUSES: SOLENOID MOTOR FAILURE (ELECTRONICS); OPEN/SHORT;
MECHANICAL FAILURE OF MOTOR/VALVE PREVENTS OPENING OR CAUSES
VALVE TO BE STUCK IN CLOSED POSITION, SWITCH FAILURE (SEE DCM),
POWER FAILURE (SEE ELECTRICAL), VIBRATION/CONTAMINATION, BLOCKED
FILTER

EFFECTS/RATIONALE:
ISOLATES H2O FROM SUBLIMATOR RESULTING IN MISSION TERMINATION AND
POSSIBLE USAGE OF SOP, IF EVA. THIS SHOULD BE RAPIDLY DETECTABLE
BY CREWPERSON. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-30
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 129

HIGHEST CRITICALITY HDW/FUNC

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:      
PART NUMBER:   SV767660-5

CAUSES:   SOLENOID MOTOR FAILURE (ELECTRONICS OPEN OR SHORT), MECHANICAL FAILURE OF MOTOR OR VALVE PREVENTS CLOSING, SWITCH FAILURE (SEE DCM), POWER FAILURE (SEE ELECTRICAL)

EFFECTS/RATIONALE: 
VALVE IS NORMALLY OPEN DURING EVA. PRE- AND POST-EVA FAILURE WILL RESULT IN H20 DUMPING TO AIRLOCK VIA SUBLIMATOR AND MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-31
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 130

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: ELECTRONICS SHORT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) FLSS
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LOCATION:
PART NUMBER: SV767660-5

CAUSES: VIBRATION/CONTAMINATION IN SOLENOID ELECTRONICS

EFFECTS/RATIONALE:
DCM CIRCUITRY PROVIDES CURRENT LIMITING. VALVE MAY POSSIBLY REMAIN IN POSITION AT TIME OF FAILURE. USE OF AVAILABLE POWER FROM BATTERY AT HIGHER RATE CAUSES MISSION TERMINATION AND, IF EMU POWER LOST, POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-32
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU   FLIGHT: 2/1R
MDAC ID: 131

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: EXCESSIVE/CONTINUOUS CURRENT DRAW - (WILL NOT SHUT OFF)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV767660-5

CAUSES: ELECTRONICS FAILURE OR SHORT, DCM SWITCH FAILURE

EFFECTS/RATIONALE:
DCM CIRCUITRY PROVIDES CURRENT LIMITING. BATTERY POWER USED AT HIGHER RATE CAN RESULT IN MISSION TERMINATION AND, IF EMU POWER LOST, POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-33
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

SUBSYSTEM: EMU
MDAC ID: 132

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/3

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)
FAILURE MODE: BIASED HIGH OR FAILED HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION: -
PART NUMBER: SV767793-8

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING

EFFECTS/RATIONALE:
IF PRE- OR POST-EVA WOULD BE DETECTABLE BY COMPARISON TO AIRLOCK SENSOR. HOWEVER, IF EVA, IT WILL REQUIRE CREWMEMBER MONITORING OF COOLING CAPABILITY TO VERIFY IF SENSOR FAILURE OR REGULATOR FAILURE.
NO IMPACT TO MISSION, EMU, OR CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-34
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)
FAILURE MODE: BIASED LOW OR FAILED LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3


LOCATION: SV767793-8

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING, LOSS OF PRESS
REF. INTEGRITY-BELLows LKG., LOSS OF POWER-OPEN

EFFECTS/RATIONALE:
IF PRE- OR POST-EVA WOULD BE DETECTABLE BY COMPARISON TO AIRLOCK
SENSOR. IF EVA, CREWMEMBER MUST MONITOR COOLING TEMPERATURE TO
VERIFY SENSOR FAILURE VERSUS REGULATOR FAILURE.
NO IMPACT.

REFERENCES:

REPORT DATE 12/02/86 C-35
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 134

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767793-8

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FDW H2O SUPPLY CAUSING DEGRADATION/LOSS OF COOLING.
MISSION TERMINATION AND, IF EVA, POSSIBLE SOP USAGE REQUIRED.
POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-36
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 135

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)  FAILURE MODE: INTERNAL SHORT

LEAD ANALYST: G. RAFFAElli  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767793-8

CAUSES: VIBRATION, FAILURE OF INSULATION, CONTAMINATION

EFFECTS/RATIONALE:
INSTRUMENT FAILURE; EXCESSIVE USE OF BATTERY POWER RESULTING IN EARLY MISSION TERMINATION. IF ALL EMU POWER LOST, MAY REQUIRE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-37
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 136

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: EXTERNAL H2O FDW LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: /NA
EVA: 2/1R
POST-EVA: /NA


LOCATION:
PART NUMBER: SV783850-14

CAUSES: SEAL FAILURE, VIBRATION

EFFECTS/RATIONALE:
LOSS OF H2O QUANTITY RESULTS IN EARLY MISSION TERMINATION DUE TO COOLING DEGRADATION/LOSS. POSSIBLE USE OF SOP MAY OCCUR. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-38
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 137

HIGHEST CRITICALITY: HDW/FUNC FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: SUBLIMATOR BLOCKED

LEAD ANALYST: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: /
EVA: 2/1R
POST-EVA: /NA


LOCATION:
PART NUMBER: SV783850-14

CAUSES: CORROSION/DEPOSITION (HISTORY OF DEPOSITION CAUSING BLOCKAGE)

EFFECTS/RATIONALE:
REDUCED COOLING CAPABILITY RESULTS IN EARLY MISSION TERMINATION AND POSSIBLE SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-39
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 138

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: EXTERNAL LCG H2O LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV783850-14

CAUSES: SUBLIMATOR INLET/OUTLET SEAL(S) FAILURE

EFFECTS/RATIONALE:
LOSS OF LCG H2O DRAINS THE FDW TANKS THEREBY REDUCING MISSION COOLING CAPABILITY. SOP WILL BE REQUIRED IF ALL H2O USED. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-40
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 139

HIGHEST CRITICALITY HDW/FUNC

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: INTERNAL LC-G-TO-FDW LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV783850-14

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
HIGH PRESSURE IN FDW GAP WILL LIKELY CAUSE BREAKTHROUGH AND FAIL EMU COOLING CAPABILITY THEREBY CAUSING CREW PERSON DISCOMFORT, AND REQUIRING SOP USAGE. TERMINATION OF MISSION IF EVA. IF SOP IS FAILED, POSSIBLE LOSS OF CREW PERSON. IF THIS OCCURS IN AIRLOCK PRE-EVA, THE AFFECTED EMU CANNOT PERFORM AN EVA MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-41
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 140

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: INTERNAL LCG-VENT LOOP LEAKAGE (H2O AND O2)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 5) 6) 7) 8) 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV783850-14

CAUSES: VIBRATION CAUSES JOINT FAILURE

EFFECTS/RATIONALE:
DURING EVA, WATER IN VENT LOOP CAN BE CARRIED OVER INTO HELMET AND SSA, WITH THE RESULTANT LOSS OF COOLING AND POSSIBLY THE VENT LOOP. THE PURGE VALVE MUST BE OPENED TO ACTIVATE THE SOP. IF THIS OCCURS, WATER CAN ENTER THE VALVE, FREEZE, AND PREVENT SOP USAGE. (ASSUMES SLURPER CANNOT HANDLE THE AMOUNT OF H2O LEAKAGE.) CREWPERSON CAN BE LOST IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-42
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 141

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: EXTERNAL VENT LOOP LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV783850-14

CAUSES: SEAL FAILURE AT INLET OR OUTLET, SLURPER OUTER SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN ATMOSPHERE WILL RESULT IN EARLY END OF MISSION AND POSSIBLE USAGE OF SOP TO PROVIDE THE EMERGENCY RETURN TO ORBITER.
POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED EVA.

REFERENCES:

REPORT DATE 12/02/86 C-43
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 142

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: SLURPER BLOCKED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV783850-14

CAUSES: CONTAMINATION, CORROSION

EFFECTS/RATIONALE:
BLOCKAGE RESULTS IN DEGRADATION OF HUMIDITY REMOVAL CAPABILITY THEREBY INCREASING THE AMOUNT OF H2O IN VENT LOOP OVER THE MISSION. AS THIS CONTINUES, WATER WILL BE CARRIED OVER INTO THE HELMET, SSA, AND WILL DEGRADE THE VENT LOOPS. MISSION TERMINATION WILL RESULT. THE SOP CAN BE USED IF VENT LOOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-44
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 143

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: EXTERNAL LEAKAGE OF H2O

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV792503-I

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O IMPACTS MISSION COOLING CAPABILITY REQUIRING MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-45
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 144

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: FAILS/BIASED HIGH

LEAD ANALYST: G. RAFFAElli  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV792503-1

CAUSES: ELECTRONICS FAILURE-SHORT DUE TO CONTAMINATION/VIBRATION

EFFECTS/RATIONALE:
ERRONEOUS C&W INDICATION. CREW PERSON CAN MANUALLY CONTROL SUIT
USING SENSORY PERCEPTION.

REFERENCES:

REPORT DATE 12/02/86  C-46
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 145

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792503-1

CAUSES: VIBRATION/CONTAMINATION IN CONNECTOR

EFFECTS/RATIONALE:
EXCESSIVE USAGE OF BATTERY POWER DURING EVA (CURRENT LIMITED)
WILL RESULT IN MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
SENSOR WILL LIKELY BE LOST.
IF POWER AND SOP FAILED, POSSIBLE CREWPERSON LOSS.

REFERENCES:

REPORT DATE 12/02/86  C-47
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 146

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: BIASED LOW OR FAILS LOW (FULL SCALE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV792503-1

CAUSES: OPEN IN ELECTRONICS DUE TO VIBRATION

EFFECTS/RATIONALE:
ERRONEOUS C&W INDICATION. CREW PERSON MUST EMPLOY SENSORY PERCEPTION. NO IMPACT.

REFERENCES:

REPORT DATE 12/02/86 C-48
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

SUBSYSTEM: EMU

 MDAC ID: 147

ITEM: PITOT ACTUATED VALVE (ITEM 125)

FAILURE MODE: INTERNAL LEAKAGE VIA NORMAL FLOW PATHS (GAS TRAP INLET TO VALVE OUTLET TO WATER SEPARATOR)

LEAD ANALYST: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:

PART NUMBER: SV769480-3

CAUSES: SEAL FAILURE INTERNAL, PLUNGER STICKS, SPRING BREAKS

EFFECTS/RATIONALE:
INTERNAL LEAKAGE WITH H2O SEPARATOR OFF CAN RESULT IN VENT LOOP FLOODING AT THE FAN WHEN WATER LOOPS ARE PRESSURIZED. SINCE H2O SEP IS NORMALLY-ON DURING EVA, THE PRIMARY IMPACTS WOULD BE PRE- AND POST-EVA AND NO IMPACT IF DURING EVA.

EMU UNAVAILABLE TO PERFORM MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-49
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 148

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: INTERNAL LEAKAGE FROM GAS TRAP INLET TO SENSE PORT

LEAD ANALYST: G. RAFFAElli  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV769480-3

CAUSES: HOUSING SEAL FAILURE, DIAPHRAM FAILURE

EFFECTS/RATIONALE:
LOSS OF DIFFERENTIAL PRESSURE ACROSS DIAPHRAM CAUSING PITOT TO CLOSE. THIS IN TURN CAUSES GAS-WATER TO BYPASS THE FAN-SEPARATOR WHICH WILL THEREBY CREATE A POSSIBLE OCCURRENCE OF A BUBBLE ENTERING THE H2O PUMP AND FAILING H2O FLOW. IF THIS OCCURS THE SOP WILL BE REQUIRED TO BE USED. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-50
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 149

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: EXTERNAL LEAKAGE (INLET FROM GAS TRAP, OUTLET TO H2O SEPARATOR, AND VIA SHAFT SEAL)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV769480-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE: H2O LEAKAGE WOULD CAUSE DEPLETION OF H2O TANKS OVER TIME, THEREBY REMOVING COOLING CAPABILITY AND POSSIBLY EXPOSING IN-SUIT LCG LINES TO VACUUM. CREWMEMBER SHOULD RETURN TO VEHICLE UPON INDICATION OF RESERVE H2O TANK USAGE AND CAN USE THE SOP IF NECESSARY.

REFERENCES:

REPORT DATE 12/02/86  C-51
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC FLIGHT: 2/1R
SUBSYSTEM: EMU
MDAC ID: 150

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: INLET FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769480-3

CAUSES: CONTAMINATION/DEPOSITION (E.G. ALUMINUM-OXIDE), CORROSION

EFFECTS/RATIONALE:
UNABLE TO MAINTAIN FLOW FROM GAS TRAP. THIS WILL INCREASE GAS CONCENTRATION IN FLUID LOOPS UNTIL SUFFICIENT AMOUNT IS ACCUMULATED TO IMPACT COOLANT FLOW AND THEREFORE COOLING CAPABILITY.
IF EVA, CREWMEMBER COULD USE THE SOP AS A REDUNDANT COOLING PATH VIA PURGE VALVE DURING RETURN TO VEHICLE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-52
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

SUBSYSTEM: EMU

MDAC ID: 151

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PITOT ACTUATED VALVE (ITEM 125)

FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:

PART NUMBER: SV769480-3

CAUSES: SPRING BREAKS, SHAFT STICKS, DIAPHRAM FAILURE CAUSES LOSS OF REFERENCE PRESSURE

EFFECTS/RATIONALE:
UNABLE TO MAINTAIN FLOW FROM GAS TRAP. THIS WILL INCREASE GAS CONCENTRATION IN FLUID LOOPS UNTIL SUFFICIENT AMOUNT IS ACCUMULATED TO IMPACT COOLANT FLOW AND THEREFORE COOLING CAPABILITY.
IF EVA, CREWMEMBER COULD USE THE SOP AS A REDUNDANT COOLING PATH VIA PURGE VALVE DURING RETURN TO VEHICLE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-53
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

SUBSYSTEM: EMU
MDAC ID: 152

HIGHEST CRITICALITY HDW/FUNC

ITEM: CHECK VALVE AND HOUSING (ITEM 128)
FAILURE MODE: EXTERNAL LEAKAGE OF H2O

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV767699-1

CAUSES:
HOUSING SEAL FAILURE, INLET/OUTLET SEAL FAILURE, TEST PORT-H CAP SEAL FAILURE.

EFFECTS/RATIONALE:
LOSS OF H2O AND DECREASED COOLING CAPABILITY. MISSION IMPACTED DUE TO LOSS OF COOLING H2O. POSSIBLE/PROBABLE USE OF SOP TO RETURN TO AIRLOCK.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-54
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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<td>LEAD ANALYST:</td>
<td>G. RAFFAELLI</td>
<td>SUBSYS LEAD: G. RAFFAELLI</td>
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<td>BREAKDOWN HIERARCHY:</td>
<td>1) EMU</td>
<td>2) LSS</td>
<td>3) PLSS</td>
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<td>HDW/FUNC</td>
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<td>PART NUMBER:</td>
<td>SV767699-1</td>
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<td>CAUSES:</td>
<td>HOUSING SEAL FAILURE, FLAPPER STUCK DUE TO CONTAMINATION OR CORROSION</td>
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<td>EFFECTS/RATIONALE:</td>
<td>CHECK VALVE IS NORMALLY OPEN WHEN ON EVA; THEREFORE NO EVA IMPACT. FAILURE PRE- OR POST-EVA CAN RESULT IN LOSS OF IMMEDIATE OR NEXT MISSION DUE TO INABILITY TO CHARGE (PRIME) H2O PUMP WITH H2O RESULTING IN LOSS OR SEVERE DEGRADATION OF H2O FLOW.</td>
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REFERENCES:

REPORT DATE 12/02/86 C-55
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 154

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: CHECK VALVE AND HOUSING (ITEM 128)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV767699-1

CAUSES:
FLAPPER STUCK CLOSED DUE TO CONTAMINATION OR CORROSION

EFFECTS/RATIONALE:
LOSS OF ALL COOLING FLOW REQUIRING IMMEDIATE TERMINATION OF EVA MISSION. LOSS OF CREWMEMBER COOLING DURING EVA REQUIRES USE OF SOP TO RETURN TO VEHICLE.
POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-56
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 155

HIGHEST CRITICALITY HDW/FUNC: FLIGHT: 2/1R

ITEM: PUMP INLET FILTER (ITEM 127)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778543-3

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O WILL CONTINUE UNTIL DEPLETED. TERMINATION OF MISSION. POSSIBLE USE OF SOP BY CREWMEMBER TO RETURN TO VEHICLE. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-57
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 156

ITEM: PUMP INLET FILTER (ITEM 127)
FAILURE MODE: BLOCKED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778543-3

CAUSES: CORROSION, CONTAMINATION

EFFECTS/RATIONALE:
CONDENSATE NOT RECIRCULATED, GOES INTO H2O TANKS AND SUBLIMATOR VIA 171 AND 172 VALVES. UNABLE TO CHARGE THE LCVG PRE- AND POST-EVA. LOSS OF MAKEUP FDW DURING EVA CAN CAUSE REDUCTION OF COOLING TO CREWMEMBER THEREBY IMPACTING MISSION. IF COOLING IS SIGNIFICANTLY DEGRADED SOP USAGE MAY BE REQUIRED. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-58
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 157

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PUMP INLET FILTER (ITEM 127)
FAILURE MODE: PASSAGE OF CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778543-3

CAUSES: FILTER ELEMENT RUPTURE, ELEMENT SEAL TO HOUSING FAILURE

EFFECTS/RATIONALE:
PUMP EXPOSED TO CONTAMINANTS. PROBABLE REDUCTION OR LOSS OF
COOLING PUMP FLOW RESULTING IN CORRESPONDING DEGRADATION/LOSS OF
COOLING. LOSS OF COOLING FLOW DURING EVA RESULTS IN MISSION
TERMINATION AND POSSIBLE USE OF SOP FOR COOLING.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-59
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 158

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV78493-3

CAUSES: HOUSING SEAL FAILURE, H2O INLET/OUTLET SEAL FAILURE, H2O/GAS OUTLET SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O WILL DRAIN SUPPLY RESULTING IN NO COOLING FOR CREWMEMBER DURING EVA. SOP WILL BE REQUIRED FOR EVA CASE; SCU FOR PRE- AND POST-EVA CASES. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS EVA.

REFERENCES:

REPORT DATE 12/02/86 C-60
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

SUBSYSTEM: EMU
MDAC ID: 159

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: GAS BREAKTHROUGH

LEAD ANALYST: G. RAFFAELEI
SUBSYS LEAD: G. RAFFAELEI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV78493-3

CAUSES: HYDROPHYLIC SCREEN DETACHES FROM HOUSING, HOUSING SEAL FAILS, GAS ORIFICE BLOCKED DUE TO CONTAMINATION

EFFECTS/RATIONALE:
FAILURE CAN RESULT IN INABILITY TO PUMP H2O DUE TO GAS IN WATER PUMP. THIS CAN CAUSE MISSION FAILURE DUE TO LOSS OF COOLING CAPABILITY, AND, IF EVA, MAY REQUIRE SOP USAGE TO RETURN TO ORBITER.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-61
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 160

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: SCREEN BLOCKED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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6) 
7) 
8) 
9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV78493-3

CAUSES: GROSS CONTAMINATION ON SCREEN, GROSS CORROSION

EFFECTS/RATIONALE:
SEVERELY RESTRICTS H2O FLOW AND THEREFORE DEGRADES COOLING TO THE CREWMEMBER. IF EVA, MISSION WILL TERMINATE AND POSSIBLE SOP USAGE MAY RESULT. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-62
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

SUBSYSTEM: EMU
MDAC ID: 161

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: INTERNAL LEAKAGE (H2O INLET TO GAS OUTLET)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV78493-3

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
EXCESSIVE FLOW TO FAN SEPARATOR CAN RESULT IN H2O CARRY-OVER TO VENT LOOP. H2O CAN THEN MIGRATE TO HELMET AND SSA WHERE PURGE VALVES ARE. IF VALVES ARE USED AND H2O FREEZES IN VALVES, SOP AND COOLING O2 SUPPLY CAPABILITY WOULD BE LOST. POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-63
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86

SUBSYSTEM: EMU

MDAC ID: 162

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)

FAILURE MODE: EXTERNAL LEAKAGE OF H20

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU
2) LSS
3) PLSS
4) 
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8) 
9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC

PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:

PART NUMBER: SV769403-6

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE (INTERNAL LEAKAGE TO AMBIENT)

EFFECTS/RATIONALE:

LOSS OF COOLING FDW REQUIRES CREWMEMBER TO TERMINATE MISSION.
POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-64
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 163

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV769403-6

CAUSES: SPRING FRACTURE, DIAPHRAM FAILURE, PLUNGER STICKS DUE TO CORROSION/CONTAMINATION, INTERNAL LEAKAGE DUE TO HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
PRIMARY IMPACT IS DURING PRE-EVA AND POST-EVA SCENARIOS WHEN FAN SEPARATOR IS OFF. VENT LOOP FLOODING, WHEN CHARGING OR RECHARGING H2O LOOPS WITH A FAILED OPEN PDW ISOLATION VALVE (171) OR CLOSE VALVE (177) WILL RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-65
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 164

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: BLOCKED INLET FILTER (FAILS CLOSED)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769403-6

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
NO FLOW PATH FOR CONDENSATE RESULTS IN VENT LOOP FLOODING AND LOSS OF FAN/SEPARATOR/H2O PUMP. CAN IMPACT USE OF SOP DUE TO POSSIBLE FREEZING AND BLOCKAGE OF PURGE VALVE (NECESSARY FOR USE OF SOP) BY FREE WATER.
POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86  C-66
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 165

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV769403-6

CAUSES: SPRING FRACTURE, PLUNGER STICKS (DUE TO CORROSION/CONTAMINATION)

EFFECTS/RATIONALE:
NO FLOW PATH FOR CONDENSATE RESULTS IN VENT LOOP FLOODING AND LOSS OF FAN/SEPARATOR/H2O PUMP. CAN IMPACT USE OF SOP DUE TO POSSIBLE FREEZING OF WATER IN THE PURGE VALVES. POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-67
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 166  FLIGHT: 3/3

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: FILTER Passes CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV769403-6

CAUSES: FILTER ELEMENT FILTER, HOUSING-TO-FILTER SEAL FAILURE

EFFECTS/RATIONALE:
POSSIBLE IMPACT TO VALVE OPERATION. DOWNSTREAM ELEMENTS ARE PROTECTED BY FILTERS. NO IMMEDIATE IMPACT TO ANY INTERFACES OR ITEMS.

REFERENCES:

REPORT DATE 12/02/86  C-68
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 167

HIGHEST CRITICALITY
H2O SHUTOFF VALVE (ITEM 171)
EXTERNAL LEAKAGE

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SEAL FAILURE AT ANY INLET OR OUTLET, HOUSING SEAL(S)

EFFECTS/RATIONALE:
LOSS OF COOLING FDW REQUIRES CREWMEMBER TO TERMINATE MISSION AND,
IF EVA, POSSIBLY USE SOP FOR COOLING.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-69
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 168

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/2R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: INTERNAL LEAKAGE - FAILS OPEN (FDW TANKS TO LCG LOOPS)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: HOUSING SEAL FAILURE, LINKAGE FAILURE

EFFECTS/RATIONALE:
PRE- AND POST-EVA FAILED OPEN (WHICH IS NORMAL EVA MODE) CAN RESULT IN VENT LOOP FLOODING WHEN FAN SEPARATOR IS OFF AND EITHER THE 125 OR 134 VALVE FAILS OPEN; THIS IN TURN CAUSES MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-70
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 169
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: FAILS CLOSED (NO FDW FLOW PATH TO LCG COOLING LOOPS)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: POPPET STUCK, OPEN ELECTRICAL CONNECTION, SHORT FROM OPEN TO CLOSED

EFFECTS/RATIONALE:
PRE- AND POST-EVA WOULD BE UNABLE TO CHARGE/RECHARGE EMU. DURING EVA, FOR SCENARIO WHERE LARGE AMOUNT OF HUMIDITY EXISTS AND THE REDUNDANT INTERFACE TO THE FDW TANKS (VIA THE 172 VALVE) IS LOST, IT MAY BE POSSIBLE TO CAUSE CONDENSATE BACK FLOW INTO THE FAN AND VENT LOOP AND LOSS OF FAN UNIT. IF SOP WERE USED, IT TOO COULD FAIL DUE TO THE PURGE VALVE BEING BLOCKED BY FROZEN WATER. LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-71
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 170

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: CONTINUOUS MOTOR DRAW OF CURRENT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SHORT

EFFECTS/RATIONALE:
AVAILABLE BATTERY POWER WILL BE DRAINED CAUSING MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-72
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET  

DATE: 9/26/86  
SUBSYSTEM: EMU  
MDAC ID: 171  
HIGHEST CRITICALITY  
HDW/FUNC  
FLIGHT: 3/IR  

ITEM: H2O SHUTOFF VALVE (ITEM 171)  
FAILURE MODE: FILTER ELEMENT BLOCKED  

LEAD ANALYST: G. RAFFAELLI  
SUBSYS LEAD: G. RAFFAELLI  

BREAKDOWN HIERARCHY:  
1) EMU  
2) LSS  
3) PLSS  
4)  
5)  
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7)  
8)  
9)  

CRITICALITIES  
FLIGHT PHASE  
HDW/FUNC  
PRE-EVA: 2/2  
EVA: 3/IR  
POST-EVA: 2/2  

REDUNDANCY SCREENS:  
A [ 2 ]  
B [ F ]  
C [ P ]  

LOCATION:  
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)  

CAUSES: GROSS CONTAMINATION, CORROSION  

EFFECTS/RATIONALE:  
LOSS OF CHARGE/RECHARGE CAPABILITY PRE- AND POST-EVA RESULTS IN MISSION IMPACT. IF EVA, H2O MAKEUP CAPABILITY WILL BE IMPACTED AS LCVG COMPLETES DEGASSING. IF THE 172 VALVE WERE FAILED CLOSED IN A HIGH HUMIDITY SCENARIO WITH THE LCVG "HARD CHARGED"; IT WOULD BE POSSIBLE TO FLOOD THE VENT LOOP AND CAUSE THE SOP TO BE REQUIRED. CREWPERSON COULD BE LOST IF SOP FAILED.  

REFERENCES:  

REPORT DATE 12/02/86 C-73
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 172

ITEM: H20 SHUTOFF VALVE (ITEM 171)
FAILURE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: CONTAMINATION IN ELECTRONICS

EFFECTS/RATIONALE:
SHORT IS CURRENT LIMITED IN DCM. VALVE COULD FAIL CLOSED AND BATTERY RESERVE COULD BE IMPACTED. IF LOW POWER DURING EVA, MISSION TERMINATION RESULTS WITH POSSIBLE SOP USAGE. POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86  C-74
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 173

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV7849982-1 (MOTOR VALVE SV784998)

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O REQUIRES MISSION TERMINATION AND POSSIBLE SOP USAGE.
POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-75
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 174

HIGHEST CRITICALITY HDW/FUNC

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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6) 
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8) 
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SPRING FRACTURE, DIAPHRAM FAILURE, PLUNGER STICKS, INTERNAL LEAKAGE DUE TO HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
DURING CHARGE OR RECHARGE, H2O IS SHORT CIRCUITED AND AN INEFFECTIVE CHARGE RESULTS. ALSO, IF 134 VALVE FAILS OPEN DURING PRE- OR POST-EVA, THE VENT LOOP COULD BE FLOODED RESULTING IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-76
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
FLIGHT: 2/1R
MDAC ID: 175

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: BLOCKED INLET FILTER

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 2/1R
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
ASSUMING A HARD CHARGE OF H2O THROUGHOUT EMU SYSTEM AND A 171 VALVE FAILED CLOSED, CONDENSATE WOULD NOT FLOW OUT OF SYSTEM INTO TANKS, THEREBY CAUSING FLOODING OF VENT LOOP AND MISSION TERMINATION. IF THE LOOP IS FLOODED FREE WATER COULD MIGRATE TO THE SSA WHERE IT COULD BLOCK THE PURGE VALVES BY FREEZING WHEN THEY ARE OPENED TO ACTIVATE THE SOP. THIS WILL RESULT IN POSSIBLE CREWPERSON LOSS IF SOP UNABLE TO OPERATE.

REFERENCES:

REPORT DATE 12/02/86 C-77
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 176

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELEI  SUBSYS LEAD: G. RAFFAELEI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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9) 

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 3/3
EVA: 2/1R
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SPRING FRACTURE, PLUNGER STICKS

EFFECTS/RATIONALE:
ASSUMING A HARD CHARGE OF H2O THROUGHOUT EMU SYSTEM AND A 171 VALVE FAILED CLOSED, CONDENSATE WOULD NOT FLOW OUT OF SYSTEM INTO TANKS, THEREBY CAUSING FLOODING OF VENT LOOP AND MISSION TERMINATION. IF THE LOOP IS FLOODED FREE WATER COULD MIGRATE TO THE SSA WHERE IT COULD BLOCK THE PURGE VALVES BY FREEZING WHEN THEY ARE OPENED TO ACTIVATE THE SOP. THIS WILL RESULT IN POSSIBLE CREWPERSON LOSS IF SOP UNABLE TO OPERATE.

REFERENCES:

REPORT DATE 12/02/86  C-78
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86
SUBSYSTEM: EMU
MDAC ID: 177

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/3

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: FILTER ELEMENT FAILURE, HOUSING-TO-FILTER SEAL FAILURE

EFFECTS/RATIONALE:
POSSIBLE IMPACT TO VALVE OPERATION. DOWNSTREAM ELEMENTS ARE
PROTECTED BY FILTERS. NO DEFINEABLE IMMEDIATE IMPACT TO ANY
INTERFACES OR ITEMS.

REFERENCES:

REPORT DATE 12/02/86 C-79
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 178

ITEM: ROTARY H2O SEPARATOR (ITEM 123 B)
FAILURE MODE: PITOT TUBE (H2O OUTLET) BLOCKED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV787994-8

CAUSES: CONTAMINATION (E.G. KOROPON)

EFFECTS/RATIONALE:
BLOCKAGE RESULTS IN H2O CARRYOVER INTO VENT LOOP PERMITTING WATER TO MIGRATE TO HELMET AND SSA. PURGE VALVES NECESSARY FOR SOP USAGE COULD POSSIBLY BE BLOCKED BY ICE. SOP USAGE REQUIRED DUE TO VENT LOOP FAILURE.
POSSIBLE LOSS OF CREWPERSON IF SOP FUNCTION FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-80
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 179

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: ROTARY H2O SEPARATOR (ITEM 123 B)
FAILURE MODE: EXTERNAL LEAKAGE (H2O OUTLET OR H2O/GAS INLET)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV787994-8

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
DEGRADATION OF COOLING FUNCTION RESULTING IN MISSION TERMINATION AND POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP FUNCTION FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-81
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 180

ITEM: ROTARY H2O SEPARATOR (ITEM 123 B)
FAILURE MODE: BEARINGS BIND

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV787994-8

CAUSES: CONTAMINATION IN BEARINGS

EFFECTS/RATIONALE:
REDUCED RPM, POSSIBLE H2O CARRYOVER INTO VENT LOOP, REDUCED VENT LOOP FLOW DUE TO COMMON SHAFT. H2O CARRYOVER CAN RESULT IN WATER MIGRATING INTO HELMET AND SSA WHERE, IF PURGE VALVE WERE USED, THE WATER COULD FREEZE IN THE VALVE AND BLOCK IT.
The PURGE VALVE IS REQUIRED FOR SOP USAGE WHICH MAY BE REQUIRED DUE TO THIS FAILURE. POSSIBLE LOSS OF CREWPERSON IF EVA.

REFERENCES:

REPORT DATE 12/02/86  C-82
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 181

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: WATER PUMP (ITEM 123C)
FAILURE MODE: EXTERNAL LEAKAGE (H2O INLET OR OUTLET)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV772277

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
DEPLETION OF H2O RESERVES, LOSS OF COOLING, MISSION TERMINATION, POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-83
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 182

HIGHEST CRITICALITY

ITEM: WATER PUMP (ITEM 123C)
FAILURE MODE: REDUCED FLOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV772277

CAUSES: BEARINGS BIND DUE TO CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
LOADS MOTOR, EXCESSIVE POWER DRAW, REDUCED VENT FLOW; MISSION TERMINATION AND, IF EVA, POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86    C-84
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 183

ITEM: WATER PUMP (ITEM 123C)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV772277

CAUSES: SEAL FAILURE, CRACK/SPLIT IN CLOSURE PLUG

EFFECTS/RATIONALE:
WATER CAN MIGRATE INTO AND FAIL MOTOR. LOSS OF COOLING AND VENTILATION. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-85
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

SUBSYSTEM: EMU
MDAC ID: 184

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: FAN (ITEM 123A)
FAILURE MODE: EXTERNAL LEAKAGE-02

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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9) ...

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV787994-8

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY 02. MISSION TERMINATION. POSSIBLE SOP USAGE.
LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-86
INDEPENDENT ORBITER ASSESSMENT
ORBITER subsystem ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 185

ITEM:  FAN (ITEM 123A)
FAILURE MODE: LOW FLOW

LEAD ANALYST: G. RAFFAElli  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV787994-8

CAUSES: BEARINGS BIND, BLADES OFF-BALANCE DUE TO CONTAMINANT BUILD-UP

EFFECTS/RATIONALE:
REduced SPEED/flow. LOADS MOTOR EXCESSIVELY. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 186

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: BEARINGS BIND OR SEIZE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV787993-7

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
OVERLOAD MOTOR, EXCESSIVE CURRENT DRAW WHICH CAN RESULT IN LOSS OF COOLING AND VENT LOOPS. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-88
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 187

HIGHEST CRITICALITY HDW/FUNC

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: FAILS OFF

LEAD ANALYST: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV787993-7

CAUSES: OPEN IN ELECTRICAL POWER LEADS OR CONNECTOR

EFFECTS/RATIONALE:
LOSS OF COOLING AND VENT LOOPS. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-89
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 188  

ITEM: BRUSHLESS MOTOR (ITEM 123B)  FAILURE MODE: LOW SPEED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV787993-7

CAUSES: WINDING OPEN OR SHORTED, SPEED CONTROL ELECTRONICS FAILURE

EFFECTS/RATIONALE:
LOW COOLING AND VENT FLOW. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-90
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 189

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: HIGH SPEED (EXCESSIVE)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES

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LOCATION:
PART NUMBER: SV787993-7

CAUSES: SPEED CONTROL ELECTRONICS FAILURE, SHORT TO WINDINGS PROVIDES CONTINUOUS CURRENT

EFFECTS/RATIONALE:
INCREASED POWER CONSUMPTION DRAINS BATTERY. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-91
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 190

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 


LOCATION:
PART NUMBER: SV787993-7

CAUSES: CONTAMINATION ACROSS LEADS, CONNECTORS, WINDINGS, INSULATION FAILS DUE TO CHAFFING

EFFECTS/RATIONALE:
IF STILL OPERATING, INCREASED POWER CONSUMPTION draws BATTERY DOWN AND REDUCES COOLING AND VENT FLOW. IF SHORT CAUSES MOTOR TO NOT OPERATE, COOLING AND VENT LOOPS ARE LOST. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-92
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 191

ITEM: MUFFLER (ITEM 170)
FAILURE MODE: EXTERNAL LEAKAGE (INLET OR OUTLET)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)  
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LOCATION:  
PART NUMBER: SV785890

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY O2 AND MISSION TERMINATION. IF EVA, SOP USAGE MAY BE REQUIRED.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-93
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/1R
MDAC ID: 192

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792600-00

CAUSES: SEAL FAILURE AT INLET OR OUTLET

EFFECTS/RATIONALE:
EXTERNAL LEAKAGE RESULTS IN DEPLETION OF PRIMARY O2, DEGRADATION OF CO2 REMOVAL CAPABILITY. MISSION TERMINATION, AND POSSIBLE USE OF SOP TO RETURN TO VEHICLE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-94
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 193

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: PARTICULATE FILTER PARTIALLY BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792600-00

CAUSES: EXCESSIVE CONTAMINANTS IN SYSTEM AT START-UP

EFFECTS/RATIONALE:
REDUCED VENT FLOW. H2O RETENTION IN LIOH BED CAUSING GRADUAL LOSS OF CO2 REMOVAL CAPABILITY. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-95
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 194

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: TEFLOM SCREEN PARTIALLY BLOCKED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV792600-00

CAUSES: EXCESSIVE CONTAMINANTS IN SYSTEM AT STARTUP

EFFECTS/RATIONALE:
REduced VENT FLOW. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-96
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 195

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)  
5)  
6)  
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8)  
9)  

CRITICALITIES
FLIGHT PHASE   HDW/FUNC
PRE-EVA: 2/2  
EVA: 2/1R  
POST-EVA: 2/2  


LOCATION:
PART NUMBER: SV792600-00

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
UNDETERMINABLE BYPASS OF LIOH. REDUCED/DEGRADED CO2 REMOVAL.
CO2 BUILDUP. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-97
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 196  FLIGHT: 2/1R

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: LiOH RELEASED TO VENT LOOP

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV792600-00

CAUSES: RUPTURE OF PARTICULATOR FILTER, FILTER SEAL SEPARATION FROM HOUSING

EFFECTS/RATIONALE:
POSSIBLE CONTAMINANT CONTRIBUTING TO FAN FAILURE, REDUCED COOLING EFFICIENCY, BLOCKAGE OF SLURPER, AND/OR MIGRATION TO AND FAILURE OF FAN SEPARATOR DUE TO CONTAMINANT BLOCKAGE OF PITOT TUBE. ALSO, LiOH IS AN IRRITANT TO CREW PERSON IF IT GETS IN EYES ORAL/NASAL PASSAGES. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-98
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86                      HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU                      FLIGHT: 2/1R
MDAC ID: 197

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV771836-28

CAUSES: SEAL FAILURE, DPN SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY 02 AND PRESSURE INTEGRITY. MISSION TERMINATION.
POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-99
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 198

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV771836-28

CAUSES: CORROSION/CONTAMINATION JAMS VALVE CLOSED, CORROSION ON BEARINGS/LINKAGE, SPRING FRACTURE

EFFECTS/RATIONALE:
LOSS OF VENT LOOP. MISSION TERMINATION AND, IF EVA, POSSIBLE SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-100
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 199

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: SENSOR FAILS LOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) ... 

CRITICALITIES

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LOCATION:
PART NUMBER: SV771836-28

CAUSES: OPEN IN ELECTRICAL CONNECTOR OR SWITCH, CORROSION ON SWITCH CONTACTS

EFFECTS/RATIONALE:
FAIL LOW WOULD IMPACT MISSION BY INDICATING INADEQUATE FLOW DURING CHECKOUT AND MISSION; THEREBY REQUIRING MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-101
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 200
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: VALVE FAILS OPEN-INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV771836-28

CAUSES: DISC WARPED/BENT, SPRING FRACTURE JAMS VALVE OPEN, CORROSION ON BEARINGS, OR LINKAGE

EFFECTS/RATIONALE:
NO IMPACT UNLESS A SECOND FAILURE (E.G. LOSS OF VENT LOOP) OCCURS REQUIRING SOP USAGE WHILE EVA. THE SOP FLOW WOULD THEN BE SPLIT AND NOT FULLY AVAILABLE TO THE ORAL-NASAL AREA OF THE CREWMEMBER, THEREBY INCREASING CO2 AND HUMIDITY LEVELS TO THE CREWMEMBER. MISSION TERMINATION WOULD THEN BE REQUIRED. ADDITIONALLY, THE PRE-EVA SOP CHECK COULD NOT BE PERFORMED WITHOUT SIGNIFICANT SOP O2 LOSS. MISSION TERMINATION WOULD RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-102
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 201

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: SENSOR FAILS HIGH

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV771836-28

CAUSES: SHORT IN ELECTRICAL SWITCH, BELLOWS FAILS LEAKING

EFFECTS/RATIONALE:
FAILING HIGH WOULD RESULT IN LOSS OF "VENT LOOP FLOW LOW" CAUTION AND WARNING TO THE CREWMEMBER. FOR PRE- AND POST-EVA OPERATIONS, THIS WOULD RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-103
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 202

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: SHORT

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV771836-28

CAUSES: CONTAMINATION ACROSS ELECTRICAL CONTACTS, WIRE CHAFFING.

EFFECTS/RATIONALE:
INCREASES USAGE OF AVAILABLE BATTERY POWER REDUCING MISSION LENGTH. POSSIBLE SOP USAGE MAY BE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-104
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
HIGHEST CRITICALITY
HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 203
FLIGHT: 2/1R

ITEM: CO2 TRANSDUCER (ITEM 122)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767798-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY 02 REQUIRING MISSION TERMINATION. MAY ALSO REQUIRE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-105
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 204  FLIGHT: 2/2

ITEM: C02 TRANSDUCER (ITEM 122)
FAILURE MODE: SENSOR FAILS HIGH

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) PLSS
5) PLSS
6) PLSS
7) PLSS
8) PLSS
9) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV767798-1

CAUSES: OPEN IN REFERENCE ELECTRICAL LEAD, ELECTRONICS FAILURE IN COMPARISON CIRCUITRY

EFFECTS/RATIONALE:
PREMATURE MISSION TERMINATION DUE TO FALSE HIGH READING.

REFERENCES:

REPORT DATE 12/02/86  C-106
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 205

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R

ITEM: C02 TRANSDUCER (ITEM 122)
FAILURE MODE: SENSOR FAILS LOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/1R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767798-1

CAUSES: LOSS OF REFERENCE, FILM DEPOSITION ON GLASS ELECTRODE, MEMBRANE BLOCKAGE, OPEN IN ELECTRONICS

EFFECTS/RATIONALE:
MULTIPLE FAILURES ARE REQUIRED FOR SIGNIFICANT IMPACT. HOWEVER, IF EVA AND THE LIOH CARTRIDGE WERE TO ALSO FAIL, HIGH UNDETECTED C02 LEVELS WOULD RESULT REQUIRING MISSION TERMINATION AND POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-107
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 206

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 2/1R

ITEM: CO2 TRANSDUCER (ITEM 122)
FAILURE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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CRITICALITIES
FLIGHT PHASE
HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767798-1

CAUSES: CONTAMINATION ACROSS LEADS, VIBRATION CAUSES CONTACT OF POWER LEADS

EFFECTS/RATIONALE:
PROBABLE LOSS OF SENSOR OUTPUT, EXCESSIVE POWER CONSUMPTION.
MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-108
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 207

ITEM: FILTER AND ORIFICE (ITEM 126)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI   SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV772158-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF PRIMARY O2 CAUSING MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-109
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 208

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R

ITEM: FILTER AND ORIFICE (ITEM 126)
FAILURE MODE: ORIFICE BLOCKED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 3/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV772158-3

CAUSES: CONTAMINATION, FILTER ELEMENT RUPTURE

EFFECTS/RATIONALE:
LOSS OF CO2 MONITORING CAPABILITY. WITH A FAILURE OF CCC CO2 REMOVAL, THE CREWMEMBER MUST RELY ON SENSORY DETECTION. IF EVA, WITH REDUNDANT CCC FAILURE POSSIBLE USE OF SOP. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-110
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 209

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: PRESSURE SUIT SENSOR (ITEM 114)
FAILURE MODE: BIAISED HIGH (OR FAILED HIGH)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
5)
6)
7)
8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767788-2

CAUSES: INTERNAL LINKAGE FAILURE, WIPER FAILURE/BINDING

EFFECTS/RATIONALE:
C&W WARNING OF HIGH PRESSURE. CREWMEMBER WILL USE GAGE ON DCM FOR VERIFICATION. MISSION IMPACT IF GAGE FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-111
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 210

HIGHEST CRITICALITY HDW/FUNC

ITEM: PRESSURE SUIT SENSOR (ITEM 114)
FAILURE MODE: BIASED LOW (OR FAILED LOW)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767788-2

CAUSES: INTERNAL LINKAGE FAILURE, WIPER FAILURE-BINDING, LOSS OF REFERENCE PRESSURE INTEGRITY-BELLOW LEAKS, LOSS OF POWER/OPEN IN ELECTRICAL LINES.

EFFECTS/RATIONALE:
C&W WARNING OF LOW PRESSURE. CREWMEMBER CAN VERIFY BY PRESSURE GAGE ON DCM. MISSION IMPACT IF GAGE FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-112
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 211

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: PRESSURE SUIT SENSOR (ITEM 114)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
TABLES LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV767788-2

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY 02 RESULTS IN EARLY MISSION TERMINATION WITH POSSIBLE USE OF SOP IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-113
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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<td>G. RAFFAELEI</td>
<td>SUBSYS LEAD:</td>
<td>G. RAFFAELEI</td>
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BREAKDOWN HIERARCHY:
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2) LSS  
3) PLSS
4)  
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REDUNDANCY SCREENS:  
A [2]  
B [F]  
C [P]  

LOCATION:  
PART NUMBER: SV767788-2  

CAUSES: CONTAMINATION, VIBRATION  

EFFECTS/RATIONALE:
SENSOR FAILURE AND INCREASE IN DEMAND UPON BATTERY. MISSION TERMINATION. IF EVA, CREWMEMBER MAY REQUIRE SOP IF BATTERY POWER INSUFFICIENT. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.  

REFERENCES:  

REPORT DATE 12/02/86  
C-114
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 213
ITEM: RELIEF VALVE AND ORIFICE (ITEM 145)
FAILURE MODE: EXTERNAL LEAKAGE
LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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LOCATION:
PART NUMBER: SV785860-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF PRIMARY 02 RESULTING IN MISSION TERMINATION. IF
EVA, SOP MAY BE REQUIRED.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-115
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

SUBSYSTEM: EMU

MDAC ID: 214

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: RELIEF VALVE AND ORIFICE (ITEM 145)

FAILURE MODE: INTERNAL LEAKAGE/FAILS OPEN

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC

PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV785860-3

CAUSES: CONTAMINATION ON SEAT, RELAXATION OF SPRING/SPRING FRACTURE, POPPET/PLUNGER STUCK DUE TO CONTAMINATION

EFFECTS/RATIONALE:
PROVIDES ADDITIONAL VENT FLOW PATH TO SUIT, THEREBY REDUCING FLOW TO HELMET AND ORAL-NASAL AREA. DURING SOP CHECKOUT, A FAILED OPEN VALVE WOULD RESULT IN HIGH SOP USAGE COULD RESULT IN MISSION TERMINATION DUE TO LOSS OF A LARGE QUANTITY OF SECONDARY OXYGEN SUPPLY. ON EVA, A SECOND FAILURE REQUIRED SOP USEAGE COULD RESULT IN INEFFECTIVE FLUSHING OF THE ORAL-NASAL AREA.

REFERENCES:

REPORT DATE 12/02/86 C-116
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 215

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/1R

ITEM: RELIEF VALVE AND ORIFICE (ITEM 145)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV785860-3

CAUSES: CONTAMINATION ACTS AS AN ADHESIVE ON BALL, SPRING FRACTURE, POPPET STICKS IN CLOSED POSITION

EFFECTS/RATIONALE:
FAILED CLOSED IS TYPICALLY OF NO IMPACT EXCEPT FOR CASE OF A FAILED OPEN SOP SECOND STAGE REGULATOR DURING SOP CHECKOUT WHICH IF IT OCCURRED WOULD RESULT IN THE SYSTEM BEING EXPOSED TO APPROXIMATELY 200 PSI OXYGEN AND POSSIBLE FAILURE OF STRUCTURAL INTEGRITY. IF THIS FAILURE WERE VIOLENT ENOUGH, A FIRE COULD START AND RESULT IN LOSS OF CREWPERSON AND/OR VEHICLE.

REFERENCES:

REPORT DATE 12/02/86 C-117
### INDEPENDENT ORBITER ASSESSMENT

#### ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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REPORT DATE 12/02/86 C-118
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 217

ITEM: POSITIVE PRESSURE RELIEF VALVE (ITEM 146)
FAILURE MODE: FAILS OPEN/INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV787036-3

CAUSES: SPRING RELAXES, SPRING FRACTURE, POPPET/PLUNGER STICKS DUE TO CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF PRIMARY 02 AT HIGH RATE. MISSION TERMINATION. IF EVA AND FAILURE RESULTS IN MAXIMUM FLOW THROUGH VALVE, THE SOP WOULD BE REQUIRED TO BE USED.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-119
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 218

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: POSITIVE PRESSURE RELIEF VALVE (ITEM 146)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV787036-3

CAUSES: SPRING FRACTURE, POPPET/PLUNGER STUCK, FILTER BLOCKED BY CONTAMINATION

EFFECTS/RATIONALE:
FOR PRE-EVA, SUIT WOULD OVERPRESSURE DURING AIRLOCK DEPRESS
RESULTING IN MISSION TERMINATION. DURING EVA, IF THE PRIMARY OR SECONDARY REGULATOR FAILS OPEN, THE PURGE VALVE MUST BE USED BY CREWMEMBER TO REDUCE SUIT PRESSURE.
POSSIBLE LOSS OF CREwperson IF SUIT PRESSURE CANNOT BE REDUCED RAPIDLY ENOUGH.

REFERENCES:

REPORT DATE 12/02/86 C-120
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 219

ITEM: NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV785927-2

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-121
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 220
HIGHEST CRITICALITY HDW/FUNC

ITEM: NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)
FAILURE MODE: FAIL OPEN

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1)  EMU
2)  LSS
3)  PLSS
4)  
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6)  
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9)  

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV785927-2

CAUSES: POPPET STUCK OPEN, SPRING FRACTURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREwperson IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-122
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 221

ITEM: NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)
FAILURE MODE: FAIL CLOSED

LEAD ANALYST: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 2/1R


LOCATION:
PART NUMBER: SV785927-2

CAUSES: POPPET STUCK DUE TO CONTAMINATION, SPRING FRACTURE, FILTER BLOCKED

EFFECTS/RATIONALE:
FAILED CLOSED WOULD IMPACT REPRESSURIZATION OF THE AIRLOCK
(ESPECIALLY AN EMERGENCY REPRESSURIZATION) IN THAT THE CAPABILITY
TO EQUALIZE PRESSURE BETWEEN THE SUIT AND AIRLOCK IS LOST VIA
ITEM 147.
SUIT DAMAGE COULD OCCUR RESULTING IN LOSS OF FUTURE MISSIONS.
POSSIBLE INJURY CAN ALSO RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-123
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 222
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: EXTERNAL LEAKAGE AT INLET

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE AT 02 FILL PORT INLET INTERFACE

EFFECTS/RATIONALE:
EXTERNAL LEAKAGE AT THIS INTERFACE SHOULD ONLY IMPACT PRE- AND POST-EVA FILL/RECHARGE OPERATIONS UNLESS ACCOMPANIED BY INTERNAL LEAKAGE SUCH THAT THE PRIMARY 02 SUPPLY WOULD BE DEPLETED. AN ACCEPTABLE FILL SHOULD STILL BE OBTAINED UNLESS Leakage IS GROSS. THIS LEAK, IF UNDETECTED, COULD ALSO DEplete VEHICLE 02 SUPPLY. LOSS OF PRIMARY 02 DURING EVA WOULD REQUIRE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-124
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: EXTERNAL LEAKAGE AT OUTLET

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE AT INTERFACE TO 02 TANK AND ORIFICE MANIFOLD

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY 02. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-125
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 224

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: INLET OR OUTLET FILTER BLOCKED
LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) FLSS
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5)
6)
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8)
9)

CRITICALITIES

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LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO FILL OR RECHARGE EMU 02 TANKS. (DURING EVA FILTERS ARE NOT USED).

REFERENCES:

REPORT DATE 12/02/86 C-126
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/1R
MDAC ID: 225

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: INLET FILTER FAILS-PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/1R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778873-12

CAUSES: FILTER ELEMENT RUPTURE, FILTER SEAL TO HOUSING FAILS

EFFECTS/RATIONALE:
CONTAMINATION COULD CAUSE CHECK VALVE FAILURE TO SEAL AND, IF
UPSTREAM EXTERNAL LEAK OCCURRED, POSSIBLE MISSION TERMINATION.
FAILURE OF THE DOWNSTREAM FILTER COULD RESULT IN BLOCKAGE OF THE
113C SHUTOFF VALVE INLET FILTER OR THE FLOW ORIFICE
AND CAUSE A REDUCED FLOW OF PRIMARY O2 TO BE PROVIDED THE
CREWPERSON. LOSS OF O2 OR IMPAIRED FLOW COULD RESULT IN SOP
USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-127
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 226

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: OUTLET FILTER FAILS-PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: FILTER ELEMENTS RUPTURE, FILTER SEAL TO HOUSING FAILS

EFFECTS/RATIONALE:
WORST CASE IS FOR THE ELEMENT TO RUPTURE (OTHERWISE INLET FILTER PROVIDES REDUNDANCY) PASSING CONTAMINANTS INTO TANKS AND ORIFICE. POSSIBLE BLOCKAGE OR FLOW CONSTRICTION IN ORIFICE. CONTAMINANTS WOULD BE FILTERED AGAIN AT SHUTOFF VALVE (113C) INLET.
IF SIGNIFICANT BLOCKAGE OCCURS, INSUFFICIENT O2 FLOW MAY RESULT FOR SUIT PRESSURIZATION DURING PRE-EVA. IF EVA, INSUFFICIENT O2 FLOW COULD RESULT IN SOP USAGE AND POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-128
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 227

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/2

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 5) 6) 7) 8) 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 3/3
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: BALL STUCK DUE TO CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO FILL OR RECHARGE.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/1R
MDAC ID: 228

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: VALVE FAILS OPEN-INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION ON SEAT

EFFECTS/RATIONALE:
VALVE FAILED OPEN WOULD REQUIRE A SECOND FAILURE OF EXTERNAL LEAKAGE UPSTREAM FOR LOSS OF PRIMARY O2 WHICH WOULD REQUIRE POSSIBLE SOP USAGE, IF EVA, AND MISSION TERMINATION. POSSIBLE LOSS OF CREWMEMBER IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-130
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 229

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: ADJUSTABLE ORIFICE (ITEM 113B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS. FOR PRE- AND
POST-EVA CHARGE/RECHARGE, IF UNDETECTED, THE LEAKAGE WILL ALSO
CAUSE LOSS OF A "LEAK-RATE DEPENDENT" QUANTITY OF VEHICLE O2.

REFERENCES:

REPORT DATE 12/02/86 C-131
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 230

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: ADJUSTABLE ORIFICE (ITEM 113B)
FAILURE MODE: NO FLOW-BLOCKED

LEAD ANALYST: G. RAFFAElli SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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6) 
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION, ADJUSTMENT SCREW ROTATES

EFFECTS/RATIONALE:
LOSS OR DEGRADATION OF O2 FLOW TO VENT LOOP AND H2O TANK
BACKPRESSURE REGULATOR. MISSION TERMINATION. POSSIBLE SOP USAGE
REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-132
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 231

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: ADJUSTABLE ORIFICE (ITEM 113B)
FAILURE MODE: HIGH FLOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 2/1R
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV778873-12

CAUSES: ADJUSTMENT SCREW Rotates, Erosion

EFFECTS/RATIONALE:
HIGH FLOW WOULD REQUIRE A PRIMARY REGULATOR OR WATER REGULATOR FAILED OPEN TO OVER PRESSURIZE THE SUIT. THE 146 RELIEF VALVE WILL NOT PROVIDE EMU PRESSURE PROTECTION AT THESE HIGH FLOW RATES. POSSIBLE LOSS OF CREWPERSON CAN THEREFORE RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-133
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 232

HIGHEST CRITICALITY HDW/FUNC

ITEM: ON/OFF VALVE (ITEM 113C)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE USE OF SOP IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-134
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 233

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: ON/OFF VALVE (ITEM 113C)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE, BALL/PLUNGER STUCK DUE TO CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO PERFORM EVA DUE TO NO O2 PATH FROM TANK TO SUIT.
MISSION TERMINATION. FUTURE MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-135
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 234

ITEM: ON/OFF VALVE (ITEM 113C)
FAILURE MODE: FAILED OPEN/INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE, BALL/PLUNGER STUCK DUE TO CONTAMINATION, CONTAMINATION ON SEAT

EFFECTS/RATIONALE:
VALVE IS NORMALLY OPEN DURING EVA. DURING PRE- OR POST-EVA TIMEFRAMES AND FOR LOW H2O TANKS, NO H2O CHARGE WOULD BE CAPABLE DUE TO BACKPRESSURE. ALSO, WOULD HAVE A CONSTANT O2 LEAK TO SUIT AND AIRLOCK. LOSS OF MISSION.

REFERENCES:

REPORT DATE 12/02/86  C-136
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 235

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN WHEN O2 SHUTOFF VALVE IS OPEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-137
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

SUBSYSTEM: EMU

MDAC ID: 236

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: PRIMARY REGULATOR (ITEM 113D)

FAILURE MODE: INTERNAL LEAKAGE/FAILED OPEN

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU

2) LSS

3) PLSS

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CRITICALITIES

FLIGHT PHASE HDW/FUNC

PRE-EVA: 2/2

EVA: 2/1R

POST-EVA: 2/2


LOCATION:

PART NUMBER: SV778873-12

CAUSES:

EXCESSIVE O2 FLOW TO SUIT. POSSIBLE OVERPRESSURIZATION REQUIRING THE 146 RELIEF VALVE TO OPERATE. LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-138
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 237

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION FAILS STEM CLOSED, SPRING FRACTURE, INLET FILTER BLOCKED

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN TO VENT LOOP. MISSION TERMINATION.
POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREW PERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-139
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

SUBSYSTEM: EMU
MDAC ID: 238

HIGHEST CRITICALITY HDW/FUNC

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: REGULATES LOW/DRIFTS LOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV778873-12

CAUSES: BALANCE STEM STICKS, SPRING RELAXES/FRACTURES, ORIFICE TO SENSE PORT BLOCKED, CONTAMINATION/DEPOSITS SKEW PARTS ALIGNMENT

EFFECTS/RATIONALE:
LOW PRESSURE CAN RESULT IN SOP USAGE TO ENSURE CREWMEMBER ENVIRONMENT MAINTAINED ABOVE 3.3 PSIA. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-140
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 239

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: REGULATES HIGH/Drifts HIGH

LEAD ANALYST: G. R AFFAELLI SUBSYS LEAD: G. R AFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLLS
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6) 
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9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES:
BALANCE STEM STICKS, SPRING RELAXES/FRACTURES, CONTAMINATION DEPOSITS SKEW PARTS ALIGNMENT

EFFECTS/RATIONALE:
HIGH PRESSURE CAN RESULT IN OVERPRESSURIZATION OF SUIT THEREBY CAUSING 146 RELIEF VALVE TO OPEN. FINAL RESULT WILL BE LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA, POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-141
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY: HDW/FUNC FLIGHT: 2/2
SUBSYSTEM: EMU
MDAC ID: 240

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: IV-EV LINKAGE FAILURE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV778873-12

CAUSES: JAMS DUE TO CONTAMINATION ACTING AS AN ADHESIVE, SPRING FRACTURE, SHEAR PLATE ASSEMBLY FAILURE (SEE SHEAR PLATE ASSEMBLY)

EFFECTS/RATIONALE:
BECAUSE THE FAILURE IS A MECHANICAL FAILURE, IT IS NOT APPLICABLE TO EVA IN THAT NO IV TO EV OR EV TO IV OPERATION OCCURS AT THAT TIME. FAILURE PRE- OR POST-EVA RESULTS IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-142
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 241

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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6) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE, BELLOWS FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN AND/OR WATER TANKS BACKPRESSURE AND THEREFORE COOLING. IF EVA, POSSIBLE SOP USAGE REQUIRED. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-143
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC

SUBSYSTEM: EMU                FLIGHT: 2/1R

MDAC ID: 242

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: FAILS OPEN-INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI       SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE         HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE, CONTAMINATION CAUSES PLUNGER TO STICK,
BELLOWS FAILURE, SEAT FAILURE DUE TO CONTAMINATION

EFFECTS/RATIONALE:
HIGH OXYGEN FLOW/PRESSURE RESULTS IN HIGHER THAN NOMINAL FLOW TO
SUIT VIA 120B RELIEF VALVE. SUIT OVERPRESSURE PROTECTED BY 146
RELIEF VALVE. LOSS OF 02 RESULTS AND MISSION IS TERMINATED. SOP
USAGE MAY BE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-144
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 243

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)...

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: REFERENCE VOLUME CONTAMINATION BLOCKS REFERENCE RESULTING IN HIGH PRESSURE REP., SPRING RELAXES

EFFECTS/RATIONALE:
DOWNSTREAM 120B RELIEF VALVE WILL OPERATE RESULTING IN EXCESS O2 FLOW TO SUIT. SUIT OVERPRESSURE PROTECTED BY 146 RELIEF VALVE. LOSS OF O2 RESULTS AND MISSION IS TERMINATED. SOP USAGE MAY BE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 244

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. Raffaelli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
5)
6)
7)
8)
9)

CRITICALITIES

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<td>2/2</td>
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LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING RELAXES

EFFECTS/RATIONALE:
LOW PRESSURE TO SUIT LCG PUMP LOOP RESULTING IN DEGRADED COOLING.
MISSION TERMINATION AND, IF EVA, POSSIBLE SOP USAGE AND CHANGING.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-146
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 245
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
5)
6)
7)
8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE/FAILURE, CONTAMINATION/CORROSION CAUSES PLUNGER TO STICK

EFFECTS/RATIONALE:
LOSS OF H2O RESERVOIR PRESSURE. COOLING LOSS. MISSION TERMINATES. IF EVA, POSSIBLE SOP USAGE REQUIRED. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-147
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 246

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRIMARY OXYGEN BOTTLES (ITEM 111)-QTY-2
FAILURE MODE: EXTERNAL LEAKAGE (NON-VIOLENT)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
5)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778895/SV784099-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE
SOP USAGE REQUIRED. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO
FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-148
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 247

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 1/1

ITEM: PRIMARY OXYGEN BOTTLES (ITEM 111)-QTY-2
FAILURE MODE: RUPTURE-VIOLENT OXYGEN RELEASE

LEAD ANALYST: G. RAFFAElli SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778895/SV784099-1

CAUSES: WELD/SEAM FAILURE, MATERIAL FATIGUE

EFFECTS/RATIONALE:
VIOLENT RELEASE OF OXYGEN WOULD BE ACCOMPANIED BY SHRAPNEL AND/OR PARTICULATE WHICH COULD IMPINGE UPON NEARBY METAL COMPONENTS AND THE EVA/IVA CREWPERSON. IN ADDITION TO SHRAPNEL INJURY, A REAL FIRE HAZARD WOULD EXIST.

REFERENCES:

REPORT DATE 12/02/86 C-149
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 248

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV778528-2

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-150
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 249

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: DRIFTS LOW (NOT FULL SCALE)

LEAD ANALYST: G. RAFFAELEI
SUBSYS LEAD: G. RAFFAELEI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778528-2

CAUSES: BINDING IN BEARING OR LINKAGE, LOSS OF REFERENCE CAVITY PRESSURE INTEGRITY

EFFECTS/RATIONALE:
(LOW READING COULD BE VERIFIED IN AIRLOCK VERSUS AIRLOCK 02 PRESSURE GAGE). CAUTION AND WARNING SYSTEM AND CREWPERSON UNABLE TO OBSERVE TOTAL PRESSURE OF 02 REMAINING. POSSIBLE MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-151
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 250
HIGHEST CRITICALITY HDW/FUNC

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: FAILS FULL LOW

LEAD ANALYST: G. RAFFAElli SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) FLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778528-2

CAUSES: OPEN IN ELECTRICAL LEAD/CONNECTOR, BINDING IN BEARING OR LINKAGE

EFFECTS/RATIONALE:
CAUTION AND WARNING SYSTEM AND THE CREW PERSON WOULD BE UNABLE TO OBSERVE THE TIME TOTAL PRESSURE OF 02 REMAINING. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-152
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 251
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRIMARY O2 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: DRIFTS HIGH (NOT FULL SCALE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) PLSS
5) PLSS
6) PLSS
7) PLSS
8) PLSS
9) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778528-2

CAUSES: BOURDON TUBE RELAXES OVER TIME, LINKAGE FAILURE, SHIFT IN WIPER TO RESISTIVE ELEMENT

EFFECTS/RATIONALE:
(VALVE CAN BE VERIFIED IN AIRLOCK VERSUS AIRLOCK O2 PRESSURE GAGE.) CAUTION AND WARNING SYSTEM IS DEFEATED IN PREDICTING MISSION PARAMETERS AND O2 REMAINING. O2 CAN BE DEPLETED DURING EVA REQUIRING SOP USAGE. POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-153
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 252

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRIMARY O2 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: FAILS HIGH-FULL SCALE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778528-2

CAUSES: SHORT IN ELECTRONICS, LINKAGE STICKS

EFFECTS/RATIONALE:
CAUTION AND WARNING SYSTEM IS NOT ABLE TO PREDICT MISSION
PARAMETERS AND PROVIDE TIME O2 REMAINING QUANTITY. MISSION
TERMINATION. IF O2 IS DEPLETED IN AN UNPLANNED MANNER DURING
EVA, SOP USAGE MAY BE REQUIRED.
POSSIBLE LOSS OF CREWPERSON LOSS IS SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-154
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 253

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 1/1

ITEM: PRIMARY O2 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: BOURDON TUBE RUPTURE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 1/1
EVA: 1/1
POST-EVA: 1/1


LOCATION:
PART NUMBER: SV778528-2

CAUSES: MATERIAL DEFECT, FATIGUE

EFFECTS/RATIONALE:
HIGH PRESSURE OXYGEN FLOW INTO CAVITY AND SENSOR ELECTRONICS
COULD RESULT IN A FIRE, LOSS OF EMU AND CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-155
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 254

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILRE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAEELI  SUBSYS LEAD: G. RAFFAEELI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
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<td>POST-EVA:</td>
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LOCATION:

PART NUMBER: SV778528-2

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
WILL LIKELY LOSE PRESSURE READING AND CAUSE EXCESS POWER USAGE.
MISSION COULD TERMINATE. POSSIBLE SOP USAGE IF BATTERY FAILURE OCCURS. POSSIBLE LOSS OF CREW PERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-156
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 255

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: 02 MANIFOLD FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV778540-26

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO CHARGE 02 TANKS. UNABLE TO OBTAIN PRIMARY OXYGEN FROM TANKS DURING EVA; THEREFORE, MISSION TERMINATION AND POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-157
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86          HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU          FLIGHT: 3/2R
MDAC ID: 256

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: 02 MANIFOLD FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI     SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV778540-26

CAUSES: FILTER RUPTURES, FILTER HOUSING SEAL FAILS

EFFECTS/RATIONALE:
CONTAMINANTS WOULD BE RELEASED WHICH COULD FAIL THE DOWNSTREAM SHUT-OFF VALVE OR WATER REGULATOR, IF THE REDUNDANT FILTERS AT EACH WERE ALSO FAILED. MISSION TERMINATION WOULD RESULT IF DETECTED.

REFERENCES:

REPORT DATE 12/02/86      C-158
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 257

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: EXTERNAL LEAKAGE OF OXYGEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 3/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778540-26

CAUSES: 02 FILL LINE SEAL FAILURE OR FITTING FAILURE (PRIOR TO 113A CHECK VALVE)

EFFECTS/RATIONALE:
EMU LEAK RESULTS IN LOSS OF VEHICLE 02 AND EXTENSION OF EMU 02 CHARGE TIME. MISSION TERMINATION. IF CHECK VALVE (ITEM 113A) ALSO FAILED OPEN, PRIMARY 02 IN TANKS WOULD BE LOST. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-159
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  
SUBSYSTEM: EMU  
MDAC ID: 258  

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)  
FAILURE MODE: EXTERNAL LEAKAGE OF OXYGEN

LEAD ANALYST: G. RAFFAELLI  
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU  
2) LSS  
3) PLSS  
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REPORT DATE 12/02/86 C-160

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LOCATION:
PART NUMBER: SV778540-26

CAUSES: SEAL FAILURE (O2 BOTTLE VERIFIED, TRANSFER TUBE FROM ITEM 113 TO 120, AND/OR 113 OUTLET TRANSFER TUBE)

EFFECTS/RATIONALE:
PRIMARY O2 LOSS. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 259

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILS IN THE "OFF" POSITION

LEAD ANALYST: G. RAFFAElli  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE—JAMS DUE TO SPRING FRACTURE, BEARING BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS

EFFECTS/RATIONALE:
UNABLE TO OPEN SHUTOFF VALVE. UNABLE TO PERFORM EVA.

REFERENCES:

REPORT DATE 12/02/86  C-161
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 260

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILS IN THE "IV" POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE-JAMS DUE TO SPRING FRACTURE, BEARING BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS, FAILURE OF LINKAGE AT THE 113 REGULATOR BY BEARINGS JAMMING

EFFECTS/RATIONALE:
UNABLE TO PRESSURIZE EMU FOR EVA. UNABLE TO SHUTOFF O2 SUPPLY FROM EMU; THEREFORE, SINCE EVA CANNOT BE PERFORMED, THE O2 WILL DUMP INTO THE AIRLOCK CREATING AN OXYGEN-RICH ATMOSPHERE UNLESS VENTILATED.

REFERENCES:

REPORT DATE 12/02/86 C-162
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 261

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILS IN THE "PRESS" POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE-JAMS DUE TO SPRING FRACTURE, BEARING BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS, FAILURE OF LINKAGE AT 113 REGULATOR BY BEARINGS JAMMING

EFFECTS/RATIONALE:
UNABLE TO OPEN SOP SHUTOFF VALVE AND UNABLE TO CLOSE PRIMARY 02 SHUTOFF VALVE. MISSION TERMINATION. 02 WILL BE DUMPED INTO THE AIRLOCK CREATING AN OXYGEN-RICH ATMOSPHERE UNLESS VENTILATED.

REFERENCES:

REPORT DATE 12/02/86 C-163
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: EMU
MDAC ID: 262

FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM i15)

FAILURE MODE: FAILS IN THE "EVA" POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE-JAMS DUE TO SPRING FRACTURE, BEARING BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS, FAILURE OF LINKAGE AT THE 113 REGULATOR BY BEARINGS JAMMING

EFFECTS/RATIONALE:
NO IMPACT TO IMMEDIATE EVA; HOWEVER SUBSEQUENT EVA MISSIONS CANNOT BE PERFORMED. REMAINING OXYGEN AND SOP OXYGEN WILL BE DUMPED TO THE AIRLOCK CREATING AN OXYGEN-RICH ENVIRONMENT UNLESS VENTILATED.
IF A SPARK WERE TO OCCUR DUE TO A SECOND FAILURE DURING THE TIME OF OXYGEN ENRICHMENT, A FIRE COULD RESULT.

REFERENCES:

REPORT DATE 12/02/86  C-164
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 263

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILURE TO OPEN THE PRIMARY 113C SHUTOFF VALVE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: /NA


LOCATION:
PART NUMBER: SV778540-26

CAUSES: SPRING FRACTURE OR RELAXATION

EFFECTS/RATIONALE:
UNABLE TO PERFORM EVA MISSION OR PRESSURIZE EMU DUE TO NO O2 PATH FROM TANKS TO SSA.

REFERENCES:

REPORT DATE 12/02/86  C-165
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 10/06/86  
**HIGHEST CRITICALITY**  
**HDW/FUNC**

<table>
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<tr>
<th>ITEM:</th>
<th>SHEAR PLATE ASSEMBLY (ITEM 115)</th>
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<tbody>
<tr>
<td>FAILURE MODE:</td>
<td>FAILURE TO CLOSE THE PRIMARY 113C SHUTOFF VALVE</td>
</tr>
</tbody>
</table>

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU  
2) LSS  
3) PLSS

**CRITICALITIES**

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<th>HDW/FUNC</th>
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<td>POST-EVA:</td>
<td>2/2</td>
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</table>

**REDUNDANCY SCREENS:**


**LOCATION:**
**PART NUMBER:** SV778540-26

**CAUSES:** SPRING FRACTURE OR RELAXATION

**EFFECTS/RATIONALE:**
PRIMARY OXYGEN WILL BE DUMPED INTO AIRLOCK CAUSING AN OXYGEN-RICH ENVIRONMENT UNLESS VENTILATED. ALSO UNABLE TO CHARGE OR RECHARGE EMU VIA SCU DUE TO OPEN PATH TO EMU.

**REFERENCES:**

**REPORT DATE 12/02/86**  
**C-166**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 265

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO OPEN SOP SHUTOFF VALVE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE/CAM FAILURE LOOSE OR STRIPPED, ACTUATOR CABLE STRETCHED

EFFECTS/RATIONALE:
SOP UNAVAILABLE FOR EVA; HOWEVER IT WOULD PERFORM THE MANUAL PRE-EVA CHECKOUT. IF OTHER FAILURE, REQUIRING TO SOP OCCURS DURING EVA, CREW MEMBER/EMU WOULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86 C-167
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 266
FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO CLOSE SOP SHUTOFF VALVE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE/CAM FAILURE-LOOSE OR STRIPPED, ACTUATOR CABLE STRETCHED

EFFECTS/RATIONALE:
SOP WOULD ACTIVATE DURING POST EVA OPERATIONS. SOP OXYGEN WOULD DUMP INTO AIRLOCK CREATING AN OXYGEN-RICH ENVIRONMENT UNLESS VENTILATED. MISSION TERMINATION RESULTS.

REFERENCES:

REPORT DATE 12/02/86  C-168
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 267

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO PLACE PRIMARY REGULATOR IN .5 PSI POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: /NA
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV778540-26

CAUSES: CHANGE LINKAGE SPRING FRACTURED OR RELAXED, BEARINGS BIND

EFFECTS/RATIONALE:
UNABLE TO PERFORM LOW-PRESSURE IV OPERATIONS; EVA MAY STILL BE PERFORMED.

REFERENCES:

REPORT DATE 12/02/86  C-169
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 268  FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO PLACE PRIMARY REGULATOR IN 4.3 PSI POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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7) 
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778540-26

CAUSES: CHANGE LINKAGE SPRING FRACTURED OR RELAXED, BEARINGS BIND

EFFECTS/RATIONALE:
UNABLE TO OBTAIN OR MAINTAIN EVA PRESSURE. POSSIBLE SOP USEAGE (DUE TO SOP BEING ENABLED) IF IN EVA POSITION AND PRESSURE DROPS TO SOP RANGE. UNABLE TO PERFORM MISSION.

REFERENCES:

REPORT DATE 12/02/86  C-170
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

HIGHEST CRITICALITY
HDW/FUNC

SUBSYSTEM: EMU

MDAC ID: 269

FLIGHT:

3/3

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)

FAILURE MODE: SLIDE ACTUATOR DETENT FAILURE

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU
2) LSS
3) PLSS
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CRITICALITIES

FLIGHT PHASE HDW/FUNC

PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3


LOCATION:

PART NUMBER: SV778540-26

CAUSES: SPRING FRACTURES OR RELAXES

EFFECTS/RATIONALE:

LOSS OF "OFF, IVA, AND PRESS" POSITIONS DISPLAY CAPABILITY. EVA CAN PROCEED WITHOUT IMPACT. "EVA" POSITION EMPLOYS AN ADDITIONAL LOCK MECHANISM AND DISPLAY CAPABILITY.

REFERENCES:

REPORT DATE 12/02/86 C-171
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 270

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: EVA POSITION LOCK FAILURE
LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778540-26

CAUSES: SPRING FRACTURES OR RELAXES

EFFECTS/RATIONALE:
EVA POSITION SLIPPAGE MAY OCCUR REQUIRING MANUAL PLACEMENT UPON C&W WARNING. BACKUP NORMAL SLIDE ACTUATOR DETENTE PROVIDES REDUNDANCY.
IF OUT OF EVA POSITION, SOP IS SHUT OFF AND UNAVAILABLE TO SUPPORT CREWPERSON IN THE EVENT OF A PLSS FAILURE REQUIRING BACK-UP. IF THIS OCCURS POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-172
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 271

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: EVA POSITION SWITCH (ITEM 116)
FAILURE MODE: FAILS OPEN-NO SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION: SV789111

CAUSES: OPEN IN LEADS OR CONNECTOR, SWITCH FRACTURE

EFFECTS/RATIONALE:
CANNOT VERIFY 02 ACTUATOR AND SOP SHUTOFF VALVE STATUS. MISSION TERMINATION. IF IT OCCURS EVA, IT WILL REQUIRE A JUDGEMENT CALL REGARDING ITS VERACITY. LOSS OF LOW SUIT PRESSURE LIMIT CHECK IN C&W WHICH IS ENABLED BY THIS SIGNAL.

REFERENCES:

REPORT DATE 12/02/86 C-173
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 272

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/2

ITEM: EVA POSITION SWITCH (ITEM 116)
FAILURE MODE: FAILS CLOSED-CONTINUOUS SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV789111

CAUSES: SHORT ACROSS LOADS OR CONNECTOR, FAILURE OF HERMETIC SEAL, CONTAMINATION

EFFECTS/RATIONALE:
CANNOT VERIFY 02 ACTUATOR AND SOP SHUTOFF VALVE STATUS. MISSION TERMINATION. IF IT OCCURS EVA, IT WILL NOT BE DETECTABLE.

REFERENCES:

REPORT DATE 12/02/86 C-174
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 273
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: BLEED ORIFICE (ITEM 120A)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV785844-6

CAUSES: HOUSING SEAL FAILURE, SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN, MISSION TERMINATION, COOLING DEGRADATION, POSSIBLE USE OF SOP IF EVA, POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-175
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 274

ITEM: BLEED ORIFICE (ITEM 120A)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<td>2/1R</td>
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<tr>
<td>POST-EVA:</td>
<td>2/2</td>
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LOCATION:
PART NUMBER: SV785844-6

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
EXCESSIVE O2 FLOW TO SUIT. POSSIBLE SUIT OVERPRESSURIZATION
OPENING RELIEF VALVE ITEM 146, RESULTING IN O2 LOSS. MISSION
TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE CREWPERSON
LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-176
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 275

ITEM: BLEED ORIFICE (ITEM 120A)
FAILURE MODE: BLOCKED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/3
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV785844-6

CAUSES: CONTAMINATION OR CORROSION IN ORIFICE, SCREEN/FILTERS BLOCKED BY CONTAMINATION OR CORROSION, UPSTREAM FILTER FAILS BY RUPTURING CAUSING ORIFICE OR DOWNSTREAM FILTER TO BLOCK

EFFECTS/RATIONALE:
POSSIBLE 113E H2O REGULATOR CHATTER. RELIEF VALVES 120B PROVIDE REDUNDANT PATH FOR CHARGING. IF THE 120B VALVES FAIL CLOSED UNABLE TO CHARGE OR RECHARGE H2O TANKS AND MISSION TERMINATION RESULTS.

REFERENCES:

REPORT DATE 12/02/86  C-177
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 276

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV785844-6

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE ALONG STEM AND SET SCREW

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-178
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

SUBSYSTEM: EMU
MDAC ID: 277

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: INTERNAL LEAKAGE/(HI OR LOW FLOW) FAILS OPEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV785844-6

CAUSES: SPRING FRACTURES OR RELAXES, CONTAMINATION ON SEAT, PLUNGER STICKS DUE TO CONTAMINATION, HOUSING SEAL BYPASSED, FILTER RUPTURES JAMMING VALVE OPEN.

EFFECTS/RATIONALE:
PROBABLE HIGH FLOW OF O2 TO SUIT AND POSSIBLE OVERPRESSURIZATION. RELIEF VALVE 146 PREVENTS OVERPRESSURIZATION BUT LOSS OF O2 OCCURS AT THIS TIME. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-179
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 278
HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: FAIL CLOSED ("LO" MODE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
5) 
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9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/3
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV785844-6

CAUSES: SPRING FRACTURE, PLUNGER STICKS, CONTAMINATION, FILTER Blocked DUE TO CONTAMINATION

EFFECTS/RATIONALE:
PROBABLE LOSS OF H2O RECHARGE CAPABILITY IF BLEED ORIFICE AND "HI" MODE VALVE ALSO FAIL CLOSED. MISSION TERMINATION RESULTS WITH THIS SCENARIO.

REFERENCES:

REPORT DATE 12/02/86 C-180
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 279

HIGHEST CRITICALITY HDW/FUNC

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: FAILS CLOSED ("HI" MODE)

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV785844-6

CAUSES: SPRING FRACTURE, PLUNGER STICKS, CONTAMINATION, FILTER BLOCKED DUE TO CONTAMINATION

EFFECTS/RATIONALE:
CANNOT EFFECTIVELY PROTECT AGAINST A FAILED OPEN 113E REGULATOR.
LOSS OF COOLING COULD RESULT DUE TO H2O TANKS BEING OVERPRESSURIZED AND FAILING. POSSIBLE SOP USAGE IF EVA.
POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-181
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 280

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER CHECK VALVE (ITEM 120C)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV785844

CAUSES: SEAL FAILURE, TEST PORT "F" SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN RESULTS IN LOSS OF COOLING AND MISSION.
POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 281

ITEM: FEEDWATER CHECK VALVE (ITEM 120C)
FAILURE MODE: FAILED OPEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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<tr>
<td>POST-EVA:</td>
<td>3/2</td>
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LOCATION:
PART NUMBER: SV785844

CAUSES: FLAPPER DISC WARPED, CONTAMINATION CAUSES FLAPPER TO STICK

EFFECTS/RATIONALE:
MOISTURE CAPABLE OF MIGRATING TO PRIMARY 113 REGULATORS AND CAUSING CORROSION. THIS CORROSION CAN CAUSE MULTIPLE TYPES OF FAILURE INCLUDING FAILED CLOSED OR OPEN THEREBY REQUIRING MISSION TERMINATION AND, IF EVA, SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-183
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 282

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER CHECK VALVE (ITEM 120C)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV785844

CAUSES: FLAPPER STICKS SHUT DUE TO CONTAMINATION OR WARPING

EFFECTS/RATIONALE:
LOSS OF FEEDWATER PRESSURE CONTROL TO TANKS RESULTING IN OVERALL LOSS OF COOLING. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSOON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-184
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 283

HIGHEST CRITICALITY

MDAC ID: 283 FLIGHT: 2/1R

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV767793-5,-7

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-185
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 284

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/2R

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: FAILED HIGH (OR BIASED HIGH)

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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LOCATION:
PART NUMBER: SV767793-5,-7

CAUSES: INTERNAL LINKAGE BINDS, WIPER BINDS

EFFECTS/RATIONALE:
ASSUMING LOSS OF ALL REDUNDANCY, THE MISSION WILL TERMINATE WITH THIS FAILURE TO PROTECT AGAINST POSSIBLE 113E REGULATOR FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-186
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 285

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: FAILED LOW (OR BIASED LOW)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767793-5,-7

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING, LOSS OF
REFERENCE PRESSURE INTEGRITY-BELLOWS LEAKAGE, LOSS OF POWER/OPEN

EFFECTS/RATIONALE:
ASSUMING LOSS OF ALL REDUNDANCY THE MISSION WILL TERMINATE WITH
THIS FAILURE TO PROTECT AGAINST POSSIBLE LOSS OF FEEDWATER
PRESSURE AND COOLING LOSS.

REFERENCES:

REPORT DATE 12/02/86 C-187
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 286

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: INTERNAL SHORT

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767793-5,-7

CAUSES: VIBRATION, FAILURE OF INSULATION, CONTAMINATION

EFFECTS/RATIONALE:
HIGH USE OF BATTERY POWER IS CURRENT LIMITED BUT CAN RESULT IN LESS OVERALL MISSION POWER. POSSIBLE LOSS OF EMU POWER. MISSION TERMINATION. POSSIBLE SOP USAGE. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-188
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 287

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767789-02

CAUSES: CELL BOND FAILS, RELIEF VALVE SEAL FAILURE

EFFECTS/RATIONALE:
LEAKAGE CAN RESULT IN SUBLIMATION OF ELECTROLYTE, ESCAPE OF HYDROGEN GAS (WHICH PRESENTS A SIGNIFICANT FIRE HAZARD IF IGNITION SOURCE EXISTS). LIKELY BATTERY FAILURE. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-189
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86                     HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R
SUBSYSTEM: EMU                     MDAC ID: 288
ITEM: BATTERY (ITEM 490)           MDAC ID: 288
FAIL MODE: RELIEF VALVE FAILS OPEN (INTERNAL LEAKAGE)

LEAD ANALYST: G. RAFFAELLI        SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1)  EMU
2)  LSS
3)  PLSS
4)  
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767789-02

CAUSES: CONTAMINATION ON SEAT, SPRING FRACTURES OR RELAXES

EFFECTS/RATIONALE:
LEAKAGE CAN RESULT IN SUBLIMINATION OF ELECTROLYTE, ESCAPE OF HYDROGEN GAS (WHICH PRESENTS A SIGNIFICANT FIRE HAZARD). LIKELY BATTERY FAILURE. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-190
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 289

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: RELIEF VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/1R
EVA: 2/1R
POST-EVA: 2/1R


LOCATION:
PART NUMBER: SV767789-02

CAUSES: CONTAMINATION ACTS AS AN ADHESIVE, CORROSION, SPRING FRACTURE

EFFECTS/RATIONALE:
POSSIBLE CELL RUPTURE DUE TO OVERPRESSURIZATION FROM OVERLOAD OR SHORT. POWER LOSS. POSSIBLE RELEASE OF HYDROGEN GAS (FIRE HAZARD). MISSION TERMINATES. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS OR IF CELL RUPTURE IS VIOLENT.

REFERENCES:

REPORT DATE 12/02/86 C-191
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 290

ITEM: BATTERY (ITEM 490)
FAILURE MODE: GENERATION OF HYDROGEN GAS

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/1R
EVA: 2/1R
POST-EVA: 2/1R


LOCATION:
PART NUMBER: SV767789-02

CAUSES: BATTERY OVERLOADED, SHORT, EXCESSIVE DISCHARGE OF BATTERY

EFFECTS/RATIONALE:
CELL PRESSURIZATION OCCURS AND RELIEVES VIA RELIEF VALVE. HYDROGEN GAS WOULD THEN BE DUMPED ABOUT THE PLSS AREA PRESENTING A POSSIBLE FIRE HAZARD. BATTERY VOLTAGE WOULD BE LOW AND THE MISSION TERMINATED. IF EVA, POSSIBLE SOP USAGE MAY BE REQUIRED. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS OR IF CELL RUPTURES VIOLENTLY DUE TO RELIEF VALVE ALSO FAILING CLOSED.

REFERENCES:

REPORT DATE 12/02/86  C-192
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 291

HIGHEST CRITICALITY HDW/FUNC

ITEM: BATTERY (ITEM 490)
FAILURE MODE: HIGH RESISTANCE OR OPEN

LEAD ANALYST: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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LOCATION:
PART NUMBER: SV767789-02

CAUSES: CONTAMINATION ON TERMINALS/CONNECTORS

EFFECTS/RATIONALE:
DROP IN BATTERY VOLTAGE. MISSION TERMINATION DUE TO POWER LOSS FROM LOW VOLTAGE. POSSIBLE SOP USAGE IF EVA. POSSIBLE CREW/PERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-193
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
FLIGHT: 2/1R
MDAC ID: 292

ITEM: BATTERY (ITEM 490)
FAILURE MODE: SHORT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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LOCATION:
PART NUMBER: SV767789-02

CAUSES: CONTAMINATION/LEAKAGE PATH ACROSS CONNECTORS

EFFECTS/RATIONALE:
BATTERY LOSS. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
GENERATION OF HYDROGEN GAS IN THE BATTERY DUE TO OVERLOAD.
POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS OR IF HYDROGEN GAS,
UNABLE TO VENT VIA RELIEF VALVE, CAUSES A VIOLENT RUPTURE OF
THE BATTERY.

REFERENCES:

REPORT DATE 12/02/86 C-194
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86

SUBSYSTEM: EMU
MDAC ID: 295

HIGHEST CRITICALITY  HDW/FUNC FLIGHT: 2/1R

ITEM: SECONARY OXYGEN BOTTLE (ITEM 210)
FAILURE MODE: EXTERNAL LEAKAGE (NON-VIOLENT)

LEAD ANALYST: G. RAFFAElli  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778880-1

CAUSES: SEAL FAILURE AT BOTTLE TO ASSY INTERFACE

EFFECTS/RATIONALE:
LOSS OF SECONDARY OXYGEN SUPPLY. MISSION TERMINATION. POSSIBLE
LOSS OF CREWPERSON IF EVA WITH FAILURE OF PLSS 02, COOLING, OR
POWER. IF PRE- OR POST-EVA, HIGH AIRLOCK 02 CONCENTRATION MAY
REQUIRE VENTILATION TO REDUCE FIRE HAZARD.

REFERENCES:

REPORT DATE 12/02/86  C-195
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 296

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 1/1

ITEM: SECONDARY OXYGEN BOTTLE (ITEM 210)
FAILURE MODE: BOTTLE RUPTURE (VIOLENT)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 1/1
EVA: 1/1
POST-EVA: 1/1


LOCATION:
PART NUMBER: SV778880-1

CAUSES: SEAM FAILURE-FROM FATIGUE (OR DEFECT) OR THERMAL CYCLING

EFFECTS/RATIONALE:
VIOLENT RUPTURE OF SOP BOTTLE CAN RESULT IN INJURY OR DEATH DUE TO SHRAPNEL AND/OR SIGNIFICANT INCREASE IN PROBABILITY OF FIRE. ADDITIONALLY, SHRAPNEL COULD PUNCTURE AND DEPRESSURIZE THE SUIT IF EVA.

REFERENCES:

REPORT DATE 12/02/86 C-196
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 297

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRESSURE TRANSUDER (ITEM 215)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778473-4

CAUSES: SEALL FAILURE

EFFECTS/RATIONALE:
LOSS OF SECONDARY OXYGEN SUPPLY. MISSION TERMINATION. POSSIBLE
LOSS OF CREWMEMBER IF PLSS FAILS 02 DELIVERY. IF SOP IN USE, LEAK
LOWERS EXPECTED DURATION OF USAGE DEPENDENT UPON LEAK SIZE.

REFERENCES:

REPORT DATE 12/02/86 C-197
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 1/1
MDAC ID: 298

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES
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LOCATION:
PART NUMBER: SV778473-4

CAUSES: MATERIAL FATIGUE/FRACTURE BETWEEN PRESSURE SENSE AND PORT TO 02 LINE

EFFECTS/RATIONALE:
HIGH-PRESSURE OXYGEN ENTERS ELECTRONICS HOUSING WHERE SOURCES OF IGNITION CAN EXIST. IF INTERNAL LEAK IS VIOLENT, FRICTION OF PARTICULATE CAN RESULT IN IGNITION SOURCE. IF IGNITION OCCURS, LOSS OF LIFE, EMU, AND POSSIBLY VEHICLE CAN RESULT.

REFERENCES:

REPORT DATE 12/02/86  C-198
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 299

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: ELECTRONICS SHORT

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
4)  
5)  
6)  
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CRITICALITIES
FLIGHT PHASE   HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:  
PART NUMBER: SV778473-4

CAUSES: VIBRATION, CONTAMINATION ACROSS LEADS/CONTACTS

EFFECTS/RATIONALE:
HIGHER THAN NOMINAL RATE OF CONSUMPTION OF POWER REDUCES OVERALL MISSION POWER AVAILABLE. POSSIBLE/PROBABLE LOSS OF SENSOR OUTPUT. POSSIBLE LOSS OF POWERED SYSTEMS REQUIRING SOP USAGE. POSSIBLE LOSS OF CREW PERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-199
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 300
FLIGHT: 3/2R

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: READS HIGH

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778473-4

CAUSES: SHORT OR OPEN IN CIRCUITRY, STRAIN GAGE FAILURE

EFFECTS/RATIONALE:
FAILURE OF SOP PRESSURE READOUT TO DCM. NO IMMEDIATE MISSION IMPACT OR IMPACT TO CREW. PRE-EVA SOP PRESSURE CAN BE VERIFIED BY THE PRESSURE GAGE ON THE 213 REGULATOR. LOSS OF CAPABILITY TO VERIFY SOP O2 PRESSURE DURING EVA.
IF IN USE, NO IMPACT OTHER THAN INABILITY TO DETERMINE AMOUNT OF O2 LEFT IN SOP. LOSS OF GAGE ALSO WOULD RESULT IN MISSION TERMINATION PRE-EVA DUE TO NO SOP MONITORING AVAILABLE.

REFERENCES:

REPORT DATE 12/02/86 C-200
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 301

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: READS LOW

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778473-4

CAUSES: SHORT OR OPEN IN CIRCUITRY, STRAIN GAGE FAILURE

EFFECTS/RATIONALE:
LOW SOP PRESSURE REQUIRES MISSION TERMINATION. IT WOULD BE A JUDGEMENT CALL AS TO THE ACCURACY OF THE TRANSDUCER VERSUS THE GAGE. FAILURE OF GAGE WOULD ONLY RESULT IN SAME EFFECT OF MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-201
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 302

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778473-13

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE, VIA TPD SEAL/CHECK VALVE FAILURE

EFFECTS/RATIONALE:
LOSS OF SOP OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH PLSS FAILURE

REFERENCES:

REPORT DATE 12/02/86  C-202
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 303

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: INTERNAL LEAKAGE/FAIL OPEN

LEAD ANALYST: G. RAFFAELEI  SUBSYS LEAD: G. RAFFAELEI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778473-13

CAUSES: SPRING FRACTURE, PLUNGER STICKS/JAMS, FAILURE OF BALL TO SEAT

EFFECTS/RATIONALE:
POSSIBLE HIGH 02 FLOW AND HIGH PRESSURE TO SECOND STAGE REGULATOR. POSSIBLE HIGH FLOW AND SUIT OVERPRESSURE CAN RESULT IF A 213D REGULATOR FAILS OPEN WHEN SOP IS ENABLED. USE OF EMU RELIEF VALVES AND/OR PURGE VALVES WOULD THEN BE NECESSARY. MISSION TERMINATION. POSSIBLE CREWPERSON LOSS IF PLSS 02 ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-203
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86

SUBSYSTEM: EMU
MDAC ID: 304

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU  
2) LSS  
3) SOP  
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<td>POST-EVA:</td>
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LOCATION:  
PART NUMBER: SV778473-13

CAUSES: SPRING FRACTURES/RELAXES, PLUNGER JAMS

EFFECTS/RATIONALE:
HIGH PRESSURE TO 213D REGULATOR CAN RESULT IN HIGH FLOW TO EMU
WITH A 213D REGULATOR FAILED OPEN. POSSIBLE SUIT OVER
PRESSURIZATION CAN RESULT IF EMU RELIEF VALVES AND/OR PURGE
VALVES FAILED.
POSSIBLE CREWPERSON LOSS IF PLSS 02 ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-204
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 305

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP

CRITICALITIES

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LOCATION:
PART NUMBER:  SV778473-13

CAUSES: SPRING FRACTURES, PLUNGER JAMS

EFFECTS/RATIONALE:
ASSUMING SOP IN USE, LOW PRESSURE TO THE 213D REGULATOR CAN RESULT IN REDUCED FLOW TO CREWPERSON AND EMU. POSSIBLE CREWPERSON LOSS IF PLSS FAILS ALSO.

REFERENCES:

REPORT DATE 12/02/86  C-205
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 306

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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6) 
7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778473-13

CAUSES: INLET FILTER BLOCKED, SPRING FRACTURES, PLUNGER JAMS

EFFECTS/RATIONALE:
ASSUMING SOP IN USE DUE TO A PLSS FAILURE, NO O2 FLOW TO CREWPERSON OR EMU CAN RESULT IN BOTH LOSS OF CREWPERSON AND EMU.

REFERENCES:

REPORT DATE 12/02/86  C-206
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 307
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 1/1

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: DIAPHRAM RUPTURE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 1/1
EVA: 1/1
POST-EVA: 1/1


LOCATION:
PART NUMBER: SV778475-13

CAUSES: FATIGUE DUE TO CYCLING

EFFECTS/RATIONALE:
A DIAPHRAM RUPTURE COULD BE VIOLENT OR COULD RESULT IN PARTICULATES BEING RELEASED TO O2 ENVIRONMENT. FOR EITHER EFFECT, POSSIBLE FIRE CAN RESULT DUE TO FRICTION.

REFERENCES:

REPORT DATE 12/02/86 C-207
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 308
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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LOCATION:
PART NUMBER: SV778475-13

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF SOP OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH FAILURE OF PLSS. IF PLSS SIDE, POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP.

REFERENCES:

REPORT DATE 12/02/86 C-208
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 309

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: INTERNAL LEAKAGE/FAIL OPEN

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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LOCATION:
PART NUMBER: SV778475-13

CAUSES: PLUNGER JAMS, SPRING FRACTURE, BALANCE STEM SEAL FAILURE (PATH VIA RV), SPRING RELAXES, BALL FAILS TO FULLY SEAT, BELLOWS (PRESSURE REFERENCE) FAILURE

EFFECTS/RATIONALE:
UNCONTROLLED OXYGEN FLOW TO EMU. POSSIBLE EMU OVERPRESSURIZATION CONTROLLED BY ITEM 146 RELIEF VALVE. TOTAL FLOW CONTROLLED BY INTERNAL ORIFICE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK REQUIRES VENTILATION.
IF EVA, HIGH PRESSURE RESULTS IN PLSS REGULATOR CLOSURE UNTIL ALL SOP OXYGEN VENTED. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON WITH LOSS OF PLSS.

REFERENCES:

REPORT DATE 12/02/86  C-209
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 310
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778475-13

CAUSES: SPRING RELAXES, SPRING FRACTURE, BALANCE STEM STICKS, CONTAMINATION ON PLUNGER/BALL

EFFECTS/RATIONALE:
HIGHER PRESSURE REALIZED IN EMU (PRESSURE LIMITED BY 146 RELIEF VALVE AND PURGE VALVES). HIGHER O2 FLOW TO EMU WHEN OPERATED. EFFECTIVELY REDUCES THE PREDICTED 30 MINUTE O2 SUPPLY AVAILABLE WHEN SOP REQUIRED. SINCE SOP REGULATION DURING EVA ONLY RESULTS AFTER A PLSS FAILURE, REDUCED O2 SUPPLY CAN RESULT IN CREWPERSON LOSS.

REFERENCES:

REPORT DATE 12/02/86 C-210
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 311

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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6) 
7) 
8) 
9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778475-13

CAUSES: SPRING FRACTURE, PLUNGER STICKS

EFFECTS/RATIONALE:
LOW PRESSURE REGULATION WOULD TERMINATE THE MISSION PRE-EVA AND RULE OUT FUTURE MISSIONS IF POST-EVA. SINCE SOP REGULATION IS NOT REQUIRED DURING AN EVA EXCEPT AFTER A PLSS FAILURE, LOW REGULATOR PRESSURE CAN RESULT IN LOSS OF LIFE DUE TO LOW A PRESSURE.

REFERENCES:

REPORT DATE 12/02/86 C-211
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 312
HIGHEST CRITICALITY HDW/FUNC

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778475-13

CAUSES: INLET FILTER BLOCKED, MECHANICAL LINKAGE FAILS TO ENABLE REGULATOR, BALL/PLUNGER JAMS

EFFECTS/RATIONALE:
FAILING CLOSED PRE- OR POST-EVA RESULTS IN TERMINATION OF THE EXISTING OR FUTURE MISSIONS. FAILURE DURING AN EVA WOULD NOT BE REALIZED UNTIL REQUIRED SUBSEQUENT TO A FAILURE OF A PRIMARY REDUNDANT FUNCTION. THE CREWPERSON WOULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86  C-212
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 313

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: MECHANICAL LINKAGE FAILS ENGAGED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778475-13

CAUSES: FATIGUE, LINKAGE JAMS

EFFECTS/RATIONALE:
THE SOP WOULD REMAIN ENGAGED DURING POST-EVA AND, WHEN AIRLOCK TO SUIT PRESSURE IS LOWER THAN 3.2 PSID, THE SOP WOULD START TO OPERATE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK COULD REQUIRE VENTILATION TO REDUCE FIRE HAZARD.
NO FUTURE MISSIONS WOULD BE POSSIBLE.

REFERENCES:

REPORT DATE 12/02/86 C-213
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 314

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: SOP PRESSURE GAGE (ITEM 213E)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778475-13

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF SECONDARY OXYGEN SUPPLY. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH LOSS OF PLSS. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK WOULD REQUIRE VENTILATION.

REFERENCES:

REPORT DATE 12/02/86 C-214
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 315

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 1/1

ITEM: SOP PRESSURE GAGE (ITEM 213E)
FAILURE MODE: BOURDON TUBE RUPTURE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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LOCATION:
PART NUMBER: SV778475-13

CAUSES: MATERIAL FATIGUE/DEFECT

EFFECTS/RATIONALE:
A RUPTURE OF THE BOURDON TUBE COULD BE VIOLENT AND RESULT IN AN OXYGEN FIRE.

REFERENCES:

REPORT DATE 12/02/86 C-215
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 316

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: SOP PRESSURE GAGE (ITEM 213E)
FAILURE MODE: FAILS HIGH

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV778475-13

CAUSES: LINKAGE FAILURE, BOURDON TUBE RELAXES, CONTAMINATION

EFFECTS/RATIONALE:
IF PRESSURE TRANSDUCER ALSO FAILS, THE CREWPERSON CANNOT VERIFY SOP PRESSURE PRIOR TO THE MISSION. MISSION TERMINATION SHOULD RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-216
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 10/07/86  
**HIGHEST CRITICALITY** HDW/FUNC 
**SUBSYSTEM:** EMU  
**FLIGHT:** 3/2R 
**MDAC ID:** 317  
**ITEM:** SOP PRESSURE GAGE (ITEM 213E)  
**FAILURE MODE:** FAILS LOW 

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI 

**BREAKDOWN HIERARCHY:**
1) EMU  
2) LSS  
3) SOP  
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**REDUNDANCY SCREENS:**  
A [2]  
B [P]  
C [P]  

**LOCATION:**  
**PART NUMBER:** SV778475-13  

**CAUSES:**  
LINKAGE FAILURE, CONTAMINATION, EXTERNAL LEAKAGE  

**EFFECTS/RATIONALE:**  
IF PRESSURE TRANSDUCER ALSO FAILS, THE CREWPERSON CANNOT VERIFY SOP PRESSURE PRIOR TO THE MISSION. MISSION TERMINATION SHOULD RESULT. 

**REFERENCES:**  

**REPORT DATE 12/02/86**  
C-217
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 318

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: SOP FILL PORT QD AND FILTER (ITEM 213F)
FAILURE MODE: EXTERNAL LEAKAGE/INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP

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LOCATION:
PART NUMBER: SV778475-13

CAUSES: SEAL FAILURE AT ASSEMBLY INTERFACE, SPRING FRACTURES/RELAXES IN CHECK VALVE, CONTAMINATION ON SEAT, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF SECONDARY OXYGEN SUPPLY. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH LOSS OF PLSS. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK WOULD REQUIRE VENTILATION.

REFERENCES:

REPORT DATE 12/02/86 C-218
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 319

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/3

ITEM: SOP FILL PORT QD AND FILTER (ITEM 213F)
FAILURE MODE: FILTER BLOCKED

LEAD ANALYST: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV778475-13

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
FILTER IS EMPLOYED DURING FILL OPERATIONS (ONGROUND ONLY), THEREFORE, NO INPUT FOR FLIGHT.

REFERENCES:

REPORT DATE 12/02/86 C-219
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 10/07/86  
**HIGHEST CRITICALITY** HDW/FUNC  
**SUBSYSTEM:** EMU  
**MDAC ID:** 320  
**FLIGHT:** 3/2R  

**ITEM:** SOP FILL PORT QD AND FILTER (ITEM 213F)  
**FAILURE MODE:** FILTER PASSES CONTAMINANTS  

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI  

**BREAKDOWN HIERARCHY:**  
1) EMU  
2) LSS  
3) SOP  
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**REDUNDANCY SCREENS:**  
A [2]  
B [F]  
C [P]  

**LOCATION:**  
**PART NUMBER:** SV778475-13  

**CAUSES:** FILTER TO HOUSING SEAL FAILS, FILTER RUPTURES  

**EFFECTS/RATIONALE:**  
GROSS PASSAGE OF CONTAMINANTS CAN RESULT IN BLOCKAGE OF DOWNSTREAM FILTERS OR CAN CONTRIBUTE TO FAILURE OF THE 1ST STAGE REGULATOR FAILURE.

**REFERENCES:**  

**REPORT DATE:** 12/02/86  
**C-220**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86
SUBSYSTEM: EMU
MDAC ID: 321

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: SOP ASSEMBLY (ITEM 200)
FAILURE MODE: BOTTLE INLET FILTER BLOCKED (ONE FILTER FOR EACH BOTTLE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
4)
5)
6)
7)
8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767710-07-08

CAUSES: EXCESSIVE CONTAMINATION IN SYSTEM

EFFECTS/RATIONALE:
DUE TO THE DELTA P WHICH THE FILTER WOULD BE EXPOSED, THE FILTER WOULD LIKELY RUPTURE AND RELEASE CONTAMINANTS DOWNSTREAM TO 1ST STAGE REGULATOR FAILURE WHICH CAN THEN FAIL DUE TO THE CONTAMINATION.
SUCH A FAILURE WOULD THEN RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-221
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 322

ITEM: SOP ASSEMBLY (ITEM 200)  FAILURE MODE: EXTERNAL LEAKAGE
LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SOP
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767710-07-08

CAUSES: DRAIN PORT "M" SEAL FAILURE, PLSS INTERFACE SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF PLSS OXYGEN. POSSIBLE CREWPERSON LOSS IF SOP FAILS DURING EVA. POSSIBLE HIGH O2 CONCENTRATION IS AIRLOCK.

REFERENCES:

REPORT DATE 12/02/86  C-222
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 323

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: EXTERNAL LEAKAGE-OXYGEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/3
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-12

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE, UNMATED: POPPET STICKS OPENS, RETURN SPRING FRACTURES/RELAXES

EFFECTS/RATIONALE:
LOSS OF OXYGEN TO EMU MAY RESULT IN OFF-NOMINAL CHARGE AND MISSION TERMINATION. AIRLOCK O2 CONCENTRATION INCREASES POSSIBLE FIRE HAZARD IF NOT WELL VENTILATED. POSSIBLE LOSS OF VEHICLE O2. DURING EVA, O2 VALVE IN AIRLOCK IS CLOSED THEREBY REDUCING LEAK CAPABILITY.

REFERENCES:

REPORT DATE 12/02/86 C-223
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 324

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: EXTERNAL LEAKAGE—FEEDWATER SUPPLY/DRAIN LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778872-12

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE; UNMATED: POPPET STICKS OPENS, RETURN SPRING FRACTURES/RELAXES

EFFECTS/RATIONALE:
LOSS OF FEEDWATER PRESSURE FOR CHARGING EMU MAY RESULT IN OFF-NOMINAL CHARGE AND MISSION TERMINATION. FREE WATER IN AIRLOCK MAY FREEZE IN AIRLOCK VENT VALVE AND BLOCK AIRLOCK DEPRESSURIZATION THEREBY TERMINATING THE MISSION. FEEDWATER SUPPLY VALVE NORMALLY OFF IN AIRLOCK AFTER INITIAL CHARGE. IF EVA PERFORMED W/O DETECTION OF FAILURE TO OBTAIN FULL FEEDWATER CHARGE, COOLING BE LOST PREMATURELY THEREBY REQUIRING SOP USAGE. IF THE SOP ALSO FAILED, CREWPERSON COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86 C-224
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**REDUNDANCY SCREENS:**

A [ 2 ]
B [ P ]
C [ P ]

**LOCATION:**
PART NUMBER: SV778872-12

**CAUSES:** SEAL FAILURE, CONNECTOR SEAL FAILURE; UNMATED: POPPET STICKS OPENS, RETURN SPRING FRACTURES/RELAXES

**EFFECTS/RATIONALE:**
POSSIBLE DEGRADED LCG COOLING, INCREASED USAGE OF FEEDWATER SUPPLY TO CHARGE LCG LINES, THEREBY POSSIBLY DEGRADING FEEDWATER CHARGE. IN EFFICIENT FEEDWATER CHARGE CAN RESULT IN MISSION TERMINATION.

**REFERENCES:**

REPORT DATE 12/02/86 C-225
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 326

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: CONNECTOR DOES NOT LATCH CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU

CRITICALITIES

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LOCATION:
PART NUMBER: SV778872-12

CAUSES: LATCH MECHANISM BINDS, COUPLINGS MISALIGN, CAM FAILURE

EFFECTS/RATIONALE:
USE OF SECOND SCU CONNECTOR REQUIRED TO PERFORM MISSION, RECHARGE (O2, H2O, AND POWER) OR INITIAL CHARGE. IF SECOND SCU IS FAILED, MISSION MUST TERMINATE.

REFERENCES:

REPORT DATE 12/02/86 C-226
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 327

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: CONNECTOR DOES NOT RELEASE OPEN

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4) 5) 6) 7) 8) 9)

CRITICALITIES

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LOCATION:
PART NUMBER: SV778872-12

CAUSES: LATCH/Lock MECHANISM BINDS, CAM FAILURE, COUPLINGS BIND

EFFECTS/RATIONALE:
EMU IS ESSENTIALLY TIED INTO THE AIRLOCK. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-227
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 328

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: ELECTRICAL POWER OPEN

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4) 
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8) 
9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-12

CAUSES: PIN PUSHED IN, CONTACT BREAKS, PIN MISALIGN/BENT, CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
EMU UNABLE TO BE POWERED VIA SCU WITH FAILURE. BATTERY MUST BE EMPLOYED AS MUST SECOND SCU. POSSIBLE MISSION IMPACT DUE TO EARLY BATTERY USAGE.

REFERENCES:

REPORT DATE 12/02/86  C-228
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 10/08/86

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**ITEM:** COMMON MULTIPLE CONNECTOR (ITEM 410)

**FAILURE MODE:** ELECTRICAL POWER SHORT

**LEAD ANALYST:** G. RAFFAELLI

**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU
2) LSS
3) SCU
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**CRITICALITIES**

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**REDUNDANCY SCREENS:**

A [ 2 ]

B [ P ]

C [ ]

**LOCATION:**

PART NUMBER: SV778872-12

**CAUSES:** PIN(S) MISALIGNED/BENT, CONTAMINATION IN CONNECTOR

**EFFECTS/RATIONALE:**

HIGH POWER USAGE ON ORBITER SYSTEM. UNABLE TO POWER EMU.
MISSION TERMINATION IF SECOND SCU FAILS. POSSIBLE MISSION IMPACTS DUE TO EARLY BATTERY USAGE.

**REFERENCES:**

REPORT DATE 12/02/86 C-229
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86

SUBSYSTEM: EMU

MDAC ID: 330

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)

FAILURE MODE: OPEN IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU
2) LSS
3) SCU
4) 
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6) 
7) 
8) 
9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC

PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, PIN FAILURE

EFFECTS/RATIONALE:
UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY BATTERY USE COULD BE A MISSION DURATION IMPACT. SECOND SCU AVAILALABLE.

REFERENCES:

REPORT DATE 12/02/86 C-230
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 331

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: SHORT IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU

CRITICALITIES

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LOCATION:
PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR CONTACTS

EFFECTS/RATIONALE:
UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY BATTERY USE COULD BE A MISSION IMPACT. SECOND SCU AVAILABLE.

REFERENCES:

REPORT DATE 12/02/86 C-231
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 332
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: OPEN IN HARDLINE, AUDIO IN OR OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, PIN FAILURE

EFFECTS/RATIONALE:
LOSS OF HARDLINE TWO-WAY COMMUNICATIONS TO VEHICLE. SECOND SCU AND EVC ARE AVAILABLE FOR COMMUNICATIONS. MISSION TERMINATES IF ALL REDUNDANCY (IN PARTICULAR TO EVC) ARE FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-232
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86

HIGHEST CRITICALITY
HDW/FUNC

SUBSYSTEM: EMU
MDAC ID: 333
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: SHORT IN HARDLINE, AUDIO IN OR OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4) ...
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CRITICALITIES

| HDW/FUNC | PRE-EVA: 3/2R | EVA: /NA | POST-EVA: 3/2R |


LOCATION:
PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR CONTACTS

EFFECTS/RATIONALE:
LOSS OF HARDLINE TWO-WAY COMMUNICATIONS TO VEHICLE. SECOND SCU AND EVC ARE AVAILABLE FOR COMMUNICATIONS. MISSION TERMINATES IF ALL REDUNDANCY (IN PARTICULAR THE EVC) ARE FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-233
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 334

ITEM: COMMON MULTIPLE CONNECTOR
FAILURE MODE: BATTERY RECHARGE, LINE-OPEN

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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LOCATION:
PART NUMBER: SV778872-12

CAUSES: PIN PUSHED IN, CONTACT BREAKS, PIN MISALIGNED/BENT, CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO CHARGE/RECHARGE BATTERY—MISSION TERMINATION IF SECOND SCU IS FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-234
### INDEPENDENT ORBITER ASSESSMENT
#### ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 10/08/86

**SUBSYSTEM:** EMU

**MDAC ID:** 335

**HIGHEST CRITICALITY**

**HDW/FUNC**

**FLIGHT:** 3/2R

**ITEM:** COMMON MULTIPLE CONNECTOR

**FAILURE MODE:** BATTERY RECHARGE, LINE-SHORT

**LEAD ANALYST:** G. RAFFAELLI

**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**

1) EMU
2) LSS
3) SCU
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**CRITICALITIES**

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**LOCATION:**

**PART NUMBER:** SV778872-12

**CAUSES:** PINS MISALIGNED/BENT, CONTAMINATION ACROSS LEADS/CONTACTS

**EFFECTS/RATIONALE:**

FAILS TO CHARGE/RECHARGE BATTERY. CAUSES EXCESSIVE BATTERY DRAIN. MISSION TERMINATION IF SECOND SCU IS FAILED.

**REFERENCES:**

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**REPORT DATE** 12/02/86 C-235
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86                  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU                  FLIGHT: 3/2R
MDAC ID: 336

ITEM: HIGH PRESSURE OXYGEN LINE (ITEM 411)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI      SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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LOCATION:
PART NUMBER: SV778865-2

CAUSES: FITTING/CONNECTOR, SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF O2 DURING CHARGE-RECHARGE. INEFFICIENT CHARGE MAY REQUIRE USE OF REMAINING SCU TO FINISH O2 CHARGE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK MAY REQUIRE VENTILATION TO MINIMIZE FIRE HAZARD. MISSION TERMINATION IF SECOND SCU IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-236
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 337

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: PORTABLE H2O LINE (ITEM 412A)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4)
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV771722-5

CAUSES: FITTING/CONNECTOR SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FEEDWATER SUPPLY FROM AIRLOCK AND EMU. WATER MAY BE VISIBLE IN AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY. BATTERY IS USED EARLY BECAUSE SCU SUPPLY H2O CANNOT BE ISOLATED FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM.
DEGRADED CHARGE/RECHARGE CAPABILITY REQUIRING SECOND SCU TO COMPLETE CHARGE. IF SECOND SCU IS FAILED, MISSION TERMINATION CAN RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-237
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 338

HIGHEST CRITICALITY HDW/FUNC

ITEM: COOLING H2O IN-LINE (ITEM 412B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4) ...
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8) ...
9) ...

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV771722-6

CAUSES: CONNECTOR/FITTING, SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF EMU FEEDWATER SUPPLY. WATER MAY BE VISIBLE IN AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY BATTERY USE BECAUSE THE H2O LEAK CANNOT BE ISOLATED FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM.
THE LEAK WILL ADDITIONALLY USE AVAILABLE FEEDWATER WHICH CAN RESULT IN AN INSUFFICIENT CHARGE. MISSION TERMINATION CAN RESULT IF SECOND SCU ALSO FAILS.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 339

ITEM: COOLING H2O OUT-LINE (ITEM 412C)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV771722-7

CAUSES: CONNECTOR/FITTING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF EMU FEEDWATER SUPPLY. WATER MAY BE VISIBLE IN AIRLOCK.
MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY POWER.
BATTERY IS USED EARLY BECAUSE THE H2O LEAK CANNOT BE ISOLATED
FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM.
THE LEAK WILL ADDITIONALLY USE AVAILABLE FEEDWATER WHICH CAN
RESULT IN AN INSUFFICIENT CHARGE. MISSION TERMINATION CAN RESULT
IF SECOND SCU ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-239
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 340

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: BACTERIAL FILTER HOUSING (ITEM 416)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767709-14

CAUSES: CONNECTOR SEAL FAILURE, SEAL FAILURE (TO REGULATORS), HOUSING SEAL FAILURE, TEST PORT "Q" AND/OR "R" SEAL FAILURES

EFFECTS/RATIONALE:
LOSS OF FEEDWATER SUPPLY IN EMU. WATER MAY BE VISIBLE IN AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY POWER. BATTERY IS USED EARLY BECAUSE THE H2O LEAK CANNOT BE ISOLATED FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM. MISSION TERMINATION IF SECOND SCU IS FAILED AND UNABLE TO RECHARGE WATER SUPPLY.

REFERENCES:

REPORT DATE 12/02/86  C-240
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 341

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: EXTERNAL LEAKAGE (EMU SIDE)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
4) 
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7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV771717-7

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FEEDWATER SUPPLY IN EMU. WATER MAY BE VISIBLE IN AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY POWER. BATTERY IS USED EARLY BECAUSE FAILED SCU MUST BE DISCONNECTED FROM DCM TO ISOLATE LEAK FROM EMU. ADDITIONALLY, THE LEAK COULD SUFFICIENTLY LOWER THE PRESSURE TO CAUSE THE REGULATOR TO OPEN AND EXPEDITE LOSS OF FEEDWATER SUPPLY. MISSION TERMINATION IF SECOND SCU IS FAILED AND UNABLE TO RECHARGE WATER SUPPLY.

REFERENCES:

REPORT DATE 12/02/86 C-241
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 342

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: EXTERNAL LEAKAGE (FILTER SIDE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU

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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: /NA
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV771717-7

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
THE LEAK IS ISOLATED BY THE REGULATOR FROM THE EMU RESULTING IN NO IMPACTS.

REFERENCES:

REPORT DATE 12/02/86 C-242
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**Highest Criticality**

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<td>Failure Mode:</td>
<td>Internal Leakage/Opens</td>
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**Lead Analyst:** G. RAFFAELLI  
**Subsys Lead:** G. RAFFAELLI

**Breakdown Hierarchy:**

1) EMU  
2) LSS  
3) SCU  
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**Criticalities**

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<td>Post-EVA:</td>
<td>3/2R</td>
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**Redundancy Screens:**  

**Location:**  
**Part Number:** SV771717-7

**Causes:**  
Spring fractures/relaxes, contamination seat, plunger sticks, housing seal leakage, manual override sticks/jams open

**Effects/Rationale:**  
Loss of SCU for H2O charge/recharge. Drainage of EMU feedwater. Mission termination if other SCU fails. Possible reduction in mission length due to early use of battery due to SCU disconnection to isolate drainage.

**References:**

**Report Date:** 12/02/86  
**C-243**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 344

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV771717-7

CAUSES: SPRING FRACTURES, STUCK PLUNGER, DIAPHRAGM STICKS,
CONTAMINATION IN AMBIENT SENSE CHAMBER CAUSES SENSE SHIFT

EFFECTS/RATIONALE:
INABILITY TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS
(WHEN EMU IS ALREADY HARD CHARGED) CAN RESULT IN H2O CARRYOVER
INTO THE VENT-LOOP OF PLSS THEREBY CAUSING MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-244
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 345

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV771717-7

CAUSES: SPRING RELAXES, CONTAMINATION ON SEAT, PLUNGER COMPRESSES SEAT

EFFECTS/RATIONALE:
(CRACKS AND RESEATS AT A LOWER WATER PRESSURE.) LOSS OF SCU FOR H2O CHARGE/RECHARGE. DRAINAGE OF EMU FEEDWATER. MISSION TERMINATION IF OTHER SCU FAILS. POSSIBLE REDUCTION IN MISSION LENGTH DUE TO EARLY USE OF BATTERY POWER REQUIRED WHEN SCU IS DISCONNECTED TO ISOLATE FAILURE FROM EMU.

REFERENCES:

REPORT DATE 12/02/86 C-245
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 346

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: REGUALTES HIGH

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU

CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV771717-7

CAUSES: SPRING FRACTURES, CONTAMINATION IN AMBIENT SENSE CHAMBER

EFFECTS/RATIONALE:
UNABLE TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS CAN RESULT IN H2O CARRYOVER INTO THE VENT-LOOP OF PLSS THEREBY CAUSING MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-246
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 347

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: MANUAL OVERRIDE JAMS (UNABLE TO OPEN VALVE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV771717-7

CAUSES: CAM BINDS, PLUNGER JAMS

EFFECTS/RATIONALE:
UNABLE TO DRAIN TANKS. CAN RESULT IN STRETCH AND REDUCED LIFETIME OF TANK BLADDERS WITH POSSIBLE FAILURE FOR NEXT MISSION IF NOT DRAINED BY SECOND SCU.

REFERENCES:

REPORT DATE 12/02/86
C-247
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 348

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 3/2R

ITEM: WATER SUPPLY PRESSURE REGULATOR (ITEM 419)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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LOCATION:
PART NUMBER: SV772190-6

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE, DIAPHRAGM FAILURE/RUPTURE

EFFECTS/RATIONALE:
LOSS OF FEEDWATER AND/OR FEEDWATER PRESSURE IN H2O TANKS.
MISSION TERMINATION RESULTS IF NO FEEDWATER AVAILABLE FROM SECOND SCU. PROBABLE MISSION IMPACT DUE TO EARLY BATTERY USAGE TO CHARGE SCU'S.

REFERENCES:

REPORT DATE 12/02/86 C-248
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 349

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: WATER SUPPLY PRESSURE REGULATOR (ITEM 419)
FAILURE MODE: INTERNAL LEAKAGE/FAILED OPEN OR REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES

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LOCATION:
PART NUMBER: SV772190-6

CAUSES: SPRING FRACTURES/RELAXES, CONTAMINATION VALVE SEAT, HOUSING SEAL FAILURE, PLUNGER JAMS/STICKS, DIAPHRAGM JAMS/STICKS

EFFECTS/RATIONALE:
H2O UP TO 17 PSID PROVIDED THE FEEDWATER TANKS OF THE EMU SHOULD RESULT IN THE CONDENSATE REGULATOR OPENING AND DRAINING THE TANKS RESULTING IN AN UNACCEPTABLE CHARGE. MISSION TERMINATION RESULTS IF SECOND SCU NOT AVAILABLE TO CHARGE FEEDWATER TANKS WITHOUT DEPLETING THEM. POSSIBLE MISSION IMPACT DUE TO EARLY BATTERY USAGE.

REFERENCES:

REPORT DATE 12/02/86 C-249
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM:  EMU
MDAC ID:  350  FLIGHT:  3/2R

ITEM: WATER SUPPLY PRESSURE REGULATOR (ITEM 419)
FAILURE MODE: FAILED CLOSED OR REGULATES LOW (BELOW 8 PSID)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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LOCATION:
PART NUMBER:  SV772190-6

CAUSES: SPRING FRACTURE, CONTAMINATION CAUSES PLUNGER TO JAM/STICK, DIAPHRAM JAMS/STICKS

EFFECTS/RATIONALE:
UNACCEPTABLE H2O CHARGE PROVIDED THE EMU. MISSION TERMINATION IF SECOND SCU NOT AVAILABLE FOR CHARGE. POSSIBLE MISSION IMPACT DUE TO EARLY BATTERY USAGE.

REFERENCES:

REPORT DATE 12/02/86  C-250
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86          HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 351

ITEM: BACTERIA CARTRIDGE (ITEM 423)
FAILURE MODE: INLET SCREEN BLOCKED/NO FLOW (SUPPLY SIDE)

LEAD ANALYST: G. RAFFAELLI        SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES

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LOCATION:
PART NUMBER: SV784967-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
LITTLE OR NO FEEDWATER CHARGE. MISSION TERMINATION IF SECOND SCU UNAVAILBLE. POSSIBLE MISSION IMPACT DUE TO EARLY BATTERY USAGE REQUIRED TO CHANGE SCU'S.

REFERENCES:

REPORT DATE 12/02/86  C-251
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 352
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/2

ITEM: BACTERIA CARTRIDGE (ITEM 423)
FAILURE MODE: INLET SCREEN BLOCKED/NO FLOW (WASTE SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV784967-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS. CAN RESULT IN H2O CARRYOVER INTO THE PLSS VENT LOOP THEREBY CAUSING MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-252
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 353

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: BACTERIA CARTRIDGE (ITEM 423)
FAILURE MODE: FAILURE OF CARTRIDGE (SUPPLY OR WASTER) TO CONTROL BACTERIA

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV784967-1

CAUSES: POOR DISTRIBUTION OF FLOW THROUGH IODINE IMPREGNATED BEADS, FAILURE OF SEAL TO BACTERIA FILTER HOUSING

EFFECTS/RATIONALE:
POSSIBLE BACTERIA/FUNGUS GROWTH IN THE EMU CAN RESULT IN BLOCKED FILTERS, INEFFICIENT COOLING, BLOCKED FAN SEPARATOR PITOT VALVE, ETC. ONE OR MORE OF THESE CAN RESULT IN LOSS OF PLSS COOLING AND/OR VENTILATION FUNCTION.
POSSIBLE SOP USEAGE IF BLOCKAGE OCCURS EVA. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-253
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: EMU

MDAC ID: 354

FLIGHT: 3/2R

ITEM: POTABLE H2O FILTER (ITEM 424)

FAILURE MODE: BLOCKED/CLOGGED (SUPPLY SIDE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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LOCATION:
PART NUMBER: SV784959-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
INABILITY TO CHARGE EMU FEEDWATER TANKS. MISSION TERMINATION WILL RESULT IF SECOND SCU UNAVAILABLE. POSSIBLE MISSION IMPACT DUE TO EARLY BATTERY USEAGE.

REFERENCES:

REPORT DATE 12/02/86 C-254
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 355

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/2

ITEM: POTABLE H2O FILTER (ITEM 424)
FAILURE MODE: BLOCKED/CLOGGED (WASTE SIDE)

LEAD ANALYST: G. RAFFAELEI SUBSYS LEAD: G. RAFFAELEI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES

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LOCATION:
PART NUMBER: SV784959-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS. CAN RESULT IN H2O CARRYOVER INTO THE PLSS VENT LOOP THEREBY CAUSING MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-255
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 356
FLIGHT: 3/2R

ITEM: O2 FILTER AND ORIFICE (ITEM 420)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778504-2

CAUSES: INLET/OUTLET SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOWER OVERALL O2 PRESSURE SUPPLIED THE EMU DURING
CHARGE/RECHARGE. INCREASES AIRLOCK O2 CONCENTRATION THEREBY
REQUIRING VENTILATION DUE TO POSSIBLE FIRE HAZARD. MISSION
TERMINATION IF OTHER SCU FAILED AND UNABLE TO COMPLETE O2 CHARGE.

REFERENCES:

REPORT DATE 12/02/86 C-256
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 357

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: O2 FILTER AND ORIFICE (ITEM 420)
FAILURE MODE: FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) SCU
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778504-2

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
NO OXYGEN PROVIDED THE EMU. MISSION TERMINATION REQUIRED IF OTHER SCU FAILED AND UNABLE TO PROVIDE O2 CHARGE TO EMU.

REFERENCES:

REPORT DATE 12/02/86 C-257
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 359

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767706-3

CAUSES: SEAL FAILURE, BOURDON TUBE LEAK

EFFECTS/RATIONALE:
LOSS OF PRIMARY O2. MISSION TERMINATION. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH SOP FAILURE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK REQUIRING VENTILATION.

REFERENCES:

REPORT DATE 12/02/86  C-258
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 360

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 1/1

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: Bourdon Tube Rupture (Violent)

LEAD ANALYST: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 1/1
EVA: 1/1
POST-EVA: 1/1


LOCATION:
PART NUMBER: SV767706-3

CAUSES: Fatigue

EFFECTS/RATIONALE:
A VIOLENT RUPTURE OF THE BOURDON TUBE CAN RESULT IN AN OXYGEN FIRE AND LOSS OF CREWPERSON/VEHICLE.

REFERENCES:

REPORT DATE 12/02/86 C-259
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 361

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: SCREEN/VENT(REFERENCE) PORT BLOCKED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

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LOCATION:
PART NUMBER: SV767706-3

CAUSES: EXCESSIVE CONTAMINATION/CORROSION

EFFECTS/RATIONALE:
LOSS OF REFERENCE WHICH, DEPENDENT UPON WHEN IT OCCURRED, COULD RESULT IN HIGH OR LOW GAGE READING. WITH LOSS OF SUIT PRESSURE TRANSDUCER 114, MISSION TERMINATION WOULD RESULT.

REFERENCES:

REPORT DATE 12/02/86  C-260
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 362

HIGHEST CRITICALITY
HDW/FUNC FLIGHT: 3/2R

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: FAILS HIGH

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

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LOCATION:
PART NUMBER: SV767706-3

CAUSES: LINKAGE JAMS/FAILS, BOURDON TUBE RELAXES

EFFECTS/RATIONALE:
CONCURRENT LOSS OF THE 114 TRANSDUCER WOULD RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-261
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86   HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 363

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: FAILS LOW

LEAD ANALYST: G. RAFFAELLI   SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

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LOCATION:
PART NUMBER: SV767706-3

CAUSES: LINKAGE JAMS/FAILS, SENSE LINE BLOCKED

EFFECTS/RATIONALE:
CONCURRENT LOSS OF THE 114 TRANSDUCER WOULD RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-262
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**ITEM:** DCM PURGE VALVE (ITEM 314)
**FAILURE MODE:** EXTERNAL LEAKAGE/INTERNAL LEAKAGE

**LEAD ANALYST:** G. RAFFAELLI
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU
2) LSS
3) DCM
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**CRITICALITIES**

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**LOCATION:**

**PART NUMBER:** SV787027-3

**CAUSES:** SEAL FAILURE, HOUSING SEAL FAILURE

**EFFECTS/RATIONALE:**
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, LOSS OF CREWPERSON WITH LOSS OF SOP. IF IN AIRLOCK, POSSIBLE HIGH O2 CONCENTRATION WILL REQUIRE VENTILATION.

**REFERENCES:**

REPORT DATE 12/02/86 C-263
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 3/1R
MDAC ID: 365 HDW/FUNC

ITEM: DCM PURGE VALVE (ITEM 314) HDW/FUNC
FAILURE MODE: INLET FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV787027-3

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
WITH A HELMET CPV FAILURE, NO OR LOW FLOW WILL RESULT IN LOSS OF PURGE CAPABILITY AND THIS SCENARIO FOR LOSS OF REDUNDANCY CAN RESULT IN THE CAPABILITY TO USE THE SOP IN THE EVENT OF A PLSS FAILURE. POSSIBLE LOSS OF CREWPERSO; OTHERWISE, MISSION TERMINATION WILL OCCUR.

REFERENCES:

C-264
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 366

ITEM: DCM PURGE VALVE (ITEM 314)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/1R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV787027-3

CAUSES: SPRING FRACTURE, PLUNGER STUCK

EFFECTS/RATIONALE:
WITH A CONCURRENT HELMET CPV FAILURE, ALL PURGE CAPABILITY WOULD BE LOST. LOSS OF THIS CAPABILITY WOULD REQUIRE A PLSS FAILURE BEFORE FAILURE WOULD BE LIFE OR VEHICLE CRITICAL WHEN EVA. OTHERWISE WITH A CPV FAILURE, THE MISSION WILL BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-265
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 367

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: DCM PURGE VALVE (ITEM 314)
FAILURE MODE: FAIL OPEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV787027-3

CAUSES: SPRING FRACTURE, PLUNGER STUCK

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, LOSS OF CREWPERSON WITH LOSS OF SOP.

REFERENCES:

REPORT DATE 12/02/86 C-266
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/1R
MDAC ID: 368

ITEM: DCM PURGE VALVE (ITEM 314)  FAILURE MODE: REDUCED FLOW

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV787027-3

CAUSES: PARTIAL BLOCKAGE OF FILTER, SPRING FRACTURE REDUCES PLUNGER TRAVEL

EFFECTS/RATIONALE:
REDUCED FLOW WILL RESULT IN AN INEFFECTIVE FLUSH OF THE CREWPERSON'S ORAL-NASAL AREA AND DECREASED THERMAL EFFECTIVITY FOR SOP USAGE DURING EVA-ASSUMES A PLSS FAILURE DURING EVA, RESULTED IN PURGE VALVE AND SOP OPERATIONS. IF CPV ALSO FAILED AND FLOW WAS SIGNIFICANTLY LOW FOR DCM PURGE VALVE, CREWPERSON COULD BE LOST, OTHERWISE, MISSION TERMINATION WOULD OCCUR.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 369

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: EXTERNAL LEAKAGE-OXYGEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778872-II

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE, UNMATED: POPPET STICKS OPEN, UNMATED: RETURN SPRING FRACTURES/RELAXES

EFFECTS/RATIONALE:
HARDWARE ITEM 113A PROVIDES REDUNDANCY IN SEALING PRIMARY 02 SUPPLY OUTLET. HOWEVER, FAILURE DURING EVA COULD, WITH A 113A FAILURE, RESULTS IN LOSS OF PRIMARY OXYGEN REQUIRING SOP USEAGE AND MISSION TERMINATION.
POSSIBLE LOSS OF CREWPERSON COULD THEN RESULT WITH AN SOP FAILURE. FAILURE WITHIN THE AIRLOCK DURING PRE- AND POST-EVA OPERATIONS COULD RESULT IN A HIGH 02 CONCENTRATION REQUIRING VENTILATION.

REFERENCES:

REPORT DATE 12/02/86 C-268
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 370

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILUR E MODE: EXTERNAL LEAKAGE- FEEDWATER SUPPLY/DRAIN LINE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778872-11

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE; UNMATED: POPPET STICKS OPEN, RETURN SPRING FRACTURE/RELAXES

EFFECTS/RATIONALE:
LOSS OF PISS FEEDWATER SUPPLY AND COOLING CAPABILITY. RESULTS IN MISSION TERMINATION A POSSIBLE LOSS OF CREWPERSON WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86  C-269
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 371

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: EXTERNAL LEAKAGE- LCG INLET-LCG OUTLET

LEAD ANALYST: G. RAFFAElli SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV778872-II

CAUSES: SEAL FAILURE, CONNECTOR FAILURE UNMATED: POPPET STICKS OPEN UNMATED: RETURN SPRING FEATURES/RELAXES

EFFECTS/RATIONALE:
LOSS OF LCG H2O AND FEEDWATER SUPPLY RESULTING IN LOSS OF COOLING. MISSION TERMINATION AND POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP.

REFERENCES:

REPORT DATE 12/02/86 C-270
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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LOCATION:
PART NUMBER:  SV778872-11

CAUSES: COUPLINGS ARE MISALIGNED, COUPLINGS BIND

EFFECTS/RATIONALE: UNABLE TO CHARGE OR RECHARGE EMU. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-271
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 373

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: FAILS TO DEMATE FROM SCU

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4)
5)
6)
7)
8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778872-11

CAUSES: COUPLINGS BIND, SPRING FRACTURE, CAN BIND

EFFECTS/RATIONALE:
UNABLE TO DETACH SCU. MISSION TERMINATION DUE TO INABILITY TO
LEAVE AIRLOCK.

REFERENCES:

REPORT DATE 12/02/86 C-272
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 374

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILRE MODE: OPEN IN POWER LINE

LEAD ANALYST: G. RAFFAEELLI
SUBSYS LEAD: G. RAFFAEELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4)
5)
6)
7)
8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONNECTOR DISCONNECTED, TERMINAL BROKEN

EFFECTS/RATIONALE:
UNABLE TO POWER EMU FOR IV OPERATIONS WITHOUT BATTERY USEAGE.
EARLY BATTERY USEAGE RESULTS IN MISSION DURATION IMPACT DUE TO LESSER AMOUNT OF POWER RESERVE AVAILABLE.

REFERENCES:

REPORT DATE 12/02/86 C-273
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86

SUBSYSTEM: EMU

MDAC ID: 375

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)

FAILURE MODE: SHORT IN POWER LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778872-II

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR/CONTACTS

EFFECTS/RATIONALE:
UNABLE TO POWER EMU FOR IV OPERATIONS WITHOUT BATTERY USEAGE.
EARLY BATTERY USEAGE RESULTS IN MISSION IMPACT/TERMINATION DUE TO LESSER AMOUNT OF POWER RESERVE AVAILABLE.

REFERENCES:

REPORT DATE 12/02/86 C-274
## INDEPENDENT ORBITER ASSESSMENT
### ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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<td>FAILURE MODE:</td>
<td>OPEN IN BATTERY RECHARGE LINE</td>
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**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI

### BREAKDOWN HIERARCHY:
1) EMU  
2) LSS  
3) DCM  
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### CRITICALITIES

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### REDUNDANCY SCREENS:
- B [ P ]  
- C [ P ]

### LOCATION:
PART NUMBER: SV778872-11

### CAUSES:
CORROSION, VIBRATION, CONNECTOR DISCONNECTED, TERMINAL BROKEN

### EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO RECHARGE BATTERY UNLESS SECOND EMU IS USED TO PERFORM RECHARGE. MISSION TERMINATION RESULTS IF SECOND EMU RECHARGE ALSO FAILS.

### REFERENCES:

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REPORT DATE 12/02/86  
C-275
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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**ITEM:** COMMON MULTIPLE CONNECTOR (ITEM 330)

**FAILURE MODE:** SHORT IN BATTERY RECHARGE LINE

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**

1) EMU  
2) LSS  
3) DCM  
4)  
5)  
6)  
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**CRITICALITIES**

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**REDUNDANCY SCREENS:**

A [ 2 ]  
B [ P ]  
C [ P ]

**LOCATION:**

**PART NUMBER:** SV778872-11

**CAUSES:** CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR/CONTACTS

**EFFECTS/RATIONALE:**

UNABLE TO CHARGE/RECHARGE BATTERY UNLESS SECOND EMU IS USED.

HOWEVER, SINCE SHORT WILL EXIST ANY TIME NOT ON BATTERY POWER, NO CONNECTION TO SCU CAN OCCUR FOR AFFECTED EMU. THEREFORE, MISSION TERMINATION SHOULD RESULT DUE TO INABILITY TO CHARGE OR RECHARGE.

**REFERENCES:**

**REPORT DATE 12/02/86**

C-276
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 378

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OPEN IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAElli SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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8) 
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, TERMINAL BROKEN, CONNECTOR DISCONNECTED

EFFECTS/RATIONALE:
UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY BATTERY USE COULD BE A MISSION DURATION IMPACT. SECOND BATTERY AVAILABLE, BUT IF FAILED MISSION TERMINATION COULD RESULT.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 379
HIGHEST CRITICALITY: FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: SHORT IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR CONTACTS

EFFECTS/RATIONALE:
UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY BATTERY USE COULD BE A MISSION DURATION IMPACT. SECOND BATTERY AVAILABLE BUT IF FAILED COULD RESULT IN MISSION TERMINATION. THIS FAILURE ALSO CAUSE A SLIGHTLY HIGHER LOAD ON THE BATTERY AND LOSS OF VOLTAGE SENSE.

REFERENCES:

REPORT DATE 12/02/86  C-278
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 380

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OPEN IN HARDLINE AUDIO IN/OUT

LEAD ANALYST: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-II

CAUSES: CORROSION, VIBRATION, TERMINAL BROKEN, CONNECTOR DISCONNECTED

EFFECTS/RATIONALE:
UNABLE TO OBTAIN HARDLINE COMMUNICATIONS. MISSION TERMINATION IF EVC FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-279
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
FLIGHT: 3/2R
MDAC ID: 381

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: SHORT IN HARDLINE AUDIO IN/OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) DCM
5) DCM
6) DCM
7) DCM
8) DCM
9) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR CONTACTS

EFFECTS/RATIONALE:
UNABLE TO OBTAIN HARDLINE VEHICLE COMMUNICATIONS. MISSION TERMINATION IF EVC FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-280
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 382

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: BATTERY RECHARGE LINE SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV778872-11

CAUSES: SWITCH CONTACT MECHANISM FAILS/STICKS, ELECTRICAL WELDING FROM ArcING

EFFECTS/RATIONALE:
NO IMPACT.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 383

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: BATTERY RECHARGE LINE SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-11

CAUSES: SWITCH CONTACT MECHANISM FAILS, CONTACT BROKEN, CORROSION

EFFECTS/RATIONALE:
UNABLE TO RECHARGE BATTERY. POSSIBLE MISSION TERMINATION IF SECOND EMU CHARGING CAPABILITY FAILS AND SPARE BATTERY NOT AVAILABLE.

REFERENCES:

REPORT DATE 12/02/86  C-282
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 384

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OXYGEN FLOW BLOCKED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4)
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7)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778872-11

CAUSES: FILTER BLOCKED DUE TO EXCESSIVE CONTAMINANTS

EFFECTS/RATIONALE:
INABILITY TO CHARGE/RECHARGE EMU OXYGEN. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-283
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 385

FLIGHT: 3/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: 02 FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
5) 
6) 
7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/1R
POST-EVA: 3/2R


LOCATION: 
PART NUMBER: SV778872-II

CAUSES: FILTER RUPTURES, FILTER SEAL TO HOUSING FAILS

EFFECTS/RATIONALE:
FAILURE OF DOWNSTREAM 113A CHECK VALVE AND FILTERS CAN RESULT IN BLOCKAGE OF THE PRIMARY REGULATOR ASSEMBLY ORIFICE OR REGULATORS. POSSIBLE BLOCKAGE OF THE 113A FILTERS AND, THEREFORE, FAILURE OF PLSS. MISSION TERMINATION WITH POSSIBLE USE OF SOP IF EVA CAN RESULT. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-284
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 386

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: LGC IN/OUT VALVE FAILS OPEN

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
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6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778872-11

CAUSES: LINKAGE MECHANISM FAILS/JAMS, CONTAMINATION/DEPOSITION CORROSION

EFFECTS/RATIONALE:
INEFFICIENT IV OPERATIONS COOLING. POSSIBLY EXPEDITE IV OPERATIONS TO EMPLOY SUBLIMATOR AT EVA. CREWPERSON DISCOMFORT. MISSION TERMINATION WITH SUBLIMATOR FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-285
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 387

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: LCG IN/OUT VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV778872-11

CAUSES: LINKAGE MECHANISM FAILS/JAMS, CONTAMINATION/DEPOSITION/CORROSION

EFFECTS/RATIONALE:
UNABLE TO OBTAIN EV OPERATIONS COOLANT FLOW PATH FOR LCG H20 LOOP. CREWPERSON DISCOMFORT. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP IF EVA PERFORMED.

REFERENCES:

REPORT DATE 12/02/86  C-286
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 388

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)
FAILURE MODE: VENT LOOP INTERFACE LEAKAGE (P2 OR P3)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4)
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV779301-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-287
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 389

ITEM: HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)
FAILURE MODE: COOLING LOOP INTERFACE LEAKAGE (P4,P5,P6,OR P7)

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV779301-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF COOLING EFFICIENCY AND MAKEUP FEEDWATER UNTIL COOLING FUNCTION LOST. MISSION TERMINATION; POSSIBLE LOSS OF CREwperson IF SOP IS FAILED.

REFERENCES:

REPORT DATE 12/02/86  C-288
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 390

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)
FAILURE MODE: POTABLE H2O LEAKAGE (P8)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV779301-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FEEDWATER FOR SUBLIMITER. COOLING FUNCTION LOST. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED

REFERENCES:

REPORT DATE 12/02/86  C-289
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU               FLIGHT: 3/2R
MDAC ID: 391
ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: SHAFT BINDS

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767784-1

CAUSES: CORROSION, BEARINGS BIND, CONTAMINATION CAUSES SHAFT TO BE STUCK

EFFECTS/RATIONALE:
LOSS OF VOLUME CONTROL FOR ONE CHANNEL. IF OTHER CHANNEL IS LOST, MISSION COMPLETION WILL BE DEPENDENT UPON THE VOLUME LEVEL OF THE REMAINING CHANNEL.

REFERENCES:

REPORT DATE 12/02/86   C-290
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 392

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: OPEN IN ONE COMMUNICATIONS LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV767784-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CORROSION, CHAFFING, WIPER FRACTURES

EFFECTS/RATIONALE:
LOSS OF VOLUME AND CONTROL FOR PARTICULAR EVC CHANNEL BEING USED.
TOTAL RADIO COMMUNICATIONS LOSS WITH LOSS OF OTHER CHANNEL WILL RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-291
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 393

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: SHORT IN ONE COMMUNICATIONS CHANNEL

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767784-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CHAFFING, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF VOLUME FOR ONE EVC CHANNEL. TOTAL RADIO COMMUNICATIONS
LOSS WITH LOSS OF OTHER CHANNEL WILL RESULT IN MISSION TERMINATION. (NOTE: PROBABLE INCREASE IN VOLUME WILL ACCOMPANY THIS FAILURE).

REFERENCES:

REPORT DATE 12/02/86  C-292
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86

SUBSYSTEM: EMU
MDAC ID: 394

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: SHORT ACROSS TWO COMMUNICATIONS CHANNELS

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767784-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CHAFFING, CONTAMINATION

EFFECTS/RATIONALE:
TOTAL LOSS OF RADIO COMMUNICATIONS WILL RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-293
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 395
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/2R

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: INCREASED RESISTANCE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV767784-1

CAUSES: CORROSION, CONTAMINATION, WIPER WEARS

EFFECTS/RATIONALE:
ASSUMING WORST CASE, HIGH RESISTANCE WILL BE VERY MUCH LIKE AN OPEN RESULTING IN LOSS OF VOLUME FOR AN EVC CHANNEL. MISSION TERMINATION CAN RESULT WITH LOSS OF OTHER CHANNEL.

REFERENCES:

REPORT DATE 12/02/86  C-294
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: EMU
FLIGHT: 2/2

MDAC ID: 396

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)

FAILURE MODE: OPEN IN LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV767785-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CORROSION, CHAFFING, WIPER FRACTURES

EFFECTS/RATIONALE:
LOSS OF DISPLAY FOR DCM RESULTS IN LOSS OF MISSION TIME, CAUTION AND WARNING MESSAGES, AND OTHER DATA. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-295
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 397

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)
FAILURE MODE: SHORT ACROSS DISPLAY LINES

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767785-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CHAFFING, CONTAMINATION

EFFECTS/RATIONALE:
DISPLAY INTENSITY MAY INCREASE TOO MUCH SUCH THAT THE DISPLAY COULD NOT BE READ. MISSION TERMINATION WOULD THEN RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-296
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 398

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)
FAILURE MODE: INCREASED RESISTANCE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV767785-1

CAUSES: CORROSION, CONTAMINATION, WIPER WEARS

EFFECTS/RATIONALE:
PROBABLE DECREASE IN DISPLAY INTENSITY MAY RESULT IN DISPLAY
BEING UNREADABLE. MISSION TERMINATION WOULD RESULT.

REFERENCES:

REPORT DATE 12/02/86  C-297
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: EMU

MDAC ID: 399

FLIGHT: 2/2

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)

FAILURE MODE: SHAFT BINDS

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU

2) LSS

3) DCM

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LOCATION:

PART NUMBER: SV767785-I

CAUSES: CORROSION, BEARINGS BIND, CONTAMINATION CAUSES SHAFT TO BE STUCK

EFFECTS/RATIONALE:

LOSS OF DISPLAY INTENSITY CONTROL. IF INTENSITY SETTING IS NOT ACCEPTABLE FOR THE MISSION, THE DISPLAY WILL BE UNREADABLE AND THE MISSION WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-298
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 400

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY HARDLINE (IV COMMUNICATIONS)
POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) ...
5) ...
6) ...
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8) ...
9) ...

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVER FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF PRIMARY WILL RESULT IN AUTOMATIC USE OF SECONDARY CIRCUITRY. COMPLETE LOSS OF IV COMMUNICATIONS WILL NOT IMPACT RADIO COMMUNICATIONS. HOWEVER, IF ALL COMMUNICATIONS ARE LOST MISSION IS TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-299
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

| DATE:       | 10/10/86 |
| SUBSYSTEM:  | EMU      |
| MDAC ID:    | 401      |
| ITEM:       | EVC SELECTOR SWITCH (ITEM 362) |
| FAILURE MODE: | OPEN IN SECONDARY HARDLINE (IV COMMUNICATIONS) |
| POSITION:   |          |
| LEAD ANALYST: | G. RAFFAELLI |
| SUBSYS LEAD: | G. RAFFAELLI |
|               |

**BREAKDOWN HIERARCHY:**
1) EMU
2) LSS
3) DCM
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**CRITICALITIES**

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**REDUNDANCY SCREENS:**

**LOCATION:**
PART NUMBER: SV767786-1

**CAUSES:** CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

**EFFECTS/RATIONALE:**
LOSS OF SECONDARY WILL RESULT IN CONTINUED USE OF PRIMARY CIRCUITRY. COMPLETE LOSS OF IV COMMUNICATIONS WILL NOT IMPACT RADIO COMMUNICATIONS. HOWEVER, COMPLETE LOSS OF COMMUNICATIONS (IV AND EV) WILL RESULT IN MISSION TERMINATION.

**REFERENCES:**

**REPORT DATE 12/02/86  C-300**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 402

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY MODE A POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF MODE A PRIMARY RESULTS IN AUTOMATIC USE OF SECONDARY CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

REPORT DATE 12/02/86  C-301
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 403

FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN SECONDARY MODE A POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF MODE A SECONDARY RESULTS IN CONTINUED USE OF PRIMARY CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

REPORT DATE 12/02/86 C-302
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 404

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY MODE B POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF MODE B PRIMARY RESULTS IN AUTOMATIC USE OF SECONDARY CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

REPORT DATE 12/02/86 C-303
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 405

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN SECONDARY MODE B POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767786-I

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF MODE B SECONDARY RESULTS IS CONTINUED USE OF PRIMARY CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

REPORT DATE 12/02/86 C-304
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 406

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY BACKUP POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF PRIMARY BACKUP RESULTS IN AUTOMATIC USE OF SECONDARY CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

REPORT DATE 12/02/86 C-305
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/2R
MDAC ID: 407

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN SECONDARY BACKUP POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF SECONDARY BACKUP RESULTS IN CONTINUED USE OF PRIMARY CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

REPORT DATE 12/02/86  C-306
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86

SUBSYSTEM: EMU

MDAC ID: 408

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)

FAILURE MODE: SHORT TO GROUND PRIMARY

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:

PART NUMBER: SV767786-1

CAUSES: CONTAMINATION, CHAFFING, VIBRATION

EFFECTS/RATIONALE:

LOSS OF PRIMARY CIRCUIT. UPSTREAM CURRENT LIMITER WILL OPERATE. HARDLINE/RADIO WOULD BE AVAILABLE BY SECONDARY CIRCUIT. IF SECONDARY CIRCUIT FAILS, MISSION TERMINATION RESULTS DUE TO RADIO LOSS.

REFERENCES:

REPORT DATE 12/02/86 C-307
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: EMU

MDAC ID: 409

FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)

FAILURE MODE: SHORT TO GROUND SECONDARY

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:

PART NUMBER: SV767786-1

CAUSES: CONTAMINATION, CHAFFING, VIBRATION

EFFECTS/RATIONALE:

LOSS OF SECONDARY CIRCUIT. THE PRIMARY EVC CIRCUIT IS REDUNDANT TO THE SECONDARY AND, IF FAILED, MISSION TERMINATION WOULD RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-308
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 410

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN HARDLINE POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO ARCING, SHAFT STICKS DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:
UNABLE TO EMPLOY EVC RADIO. MISSION TERMINATION RESULTS.

REFERENCES:

REPORT DATE 12/02/86 C-309
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 411

HIGHEST CRITICALITY HDW/FUNC

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN MODE A POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO ARCING, SHAFT STICKS DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:
EVC RADIO PERMANENTLY ENGAGED. EVA MISSION CAN BE PERFORMED. IV HARDLINE OPS MUST BE PERFORMED EMPLOYING RADIO.

REFERENCES:

REPORT DATE 12/02/86 C-310
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 412

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/3

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN MODE B POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 5) 6) 7) 8) 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO ARCING, SHAFT STICKS DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:
EVC RADIO PERMANENTLY ENGAGED. EVA MISSION CAN BE PERFORMED. IV HARDLINE OPS MUST BE PERFORMED EMPLOYING RADIO.

REFERENCES:

REPORT DATE 12/02/86 C-311
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/3
MDAC ID: 413

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN BACKUP POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER:  SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO Arcing, SHAFT STICKS DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:
EVC RADIO PERMANENTLY ENGAGED. EVA MISSION CAN BE PERFORMED. IV HARDLINE OPS MUST BE PERFORMED EMPLOYING RADIO.

REFERENCES:

REPORT DATE 12/02/86  C-312
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86                      HIGHEST CRITICALITY          HDW/FUNC
SUBSYSTEM: EMU                      FLIGHT: 3/2R
MDAC ID: 414

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY CHARGE FROM VEHICLE
(T7 OPEN)-STICKS IN T8 POSITION

LEAD ANALYST: G. RAFFAELLI        SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE
RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION
FRACTURES CONTACT JOINT, LEAF SPRING FRACUTURES/RELAXES-UNABLE TO
CHANGE SWITCH POSITION

EFFECTS/RATIONALE:
UNABLE TO CHARGE BATTERY. WOULD REQUIRE USE OF SECOND EMU TO
CHARGE BATTERY OR A SPARE BATTERY. LOSS OF THESE REDUNDANCIES CAN
RESULT IN MISSION TERMINATION DUE TO INABILITY TO PERFORM POWERED
EVA.

REFERENCES:

REPORT DATE 12/02/86 C-313
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: EMU

MDAC ID: 415

FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)

FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY POWER FROM BATTERY (T8 OPEN) - STICKS IN T7 POSITION

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 2/2
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES - UNABLE TO CHANGE SWITCH POSITION

EFFECTS/RATIONALE:
BATTERY POWER UNAVAILABLE TO ELECTRONICS DURING EVA. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-314
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 416

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY CHARGE CONTACT (T9 OPEN)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE
RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION
FRACUTRES CONTACT JOINT, LEAF SPRING FRACUTRES/RELAXES-UNABLE TO
CHANGE SWITCH POSITION, CONTACT FAILS

EFFECTS/RATIONALE:
UNABLE TO CHARGE BATTERY. WOULD REQUIRE USE OF SECOND EMU TO
CHARGE BATTERY OR A SPARE BATTERY. LOSS OF THESE REDUNDANCIES CAN
RESULT IN MISSION TERMINATION DUE TO INABILITY TO PERFORM EVA.
BATTERY POWER UNAVAILABLE TO ELECTRONICS DURING EVA.
MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-315
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 417

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR VEHICLE POWER (T4 OPEN) - STICKS IN T5 POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES - UNABLE TO CHANGE SWITCH POSITION

EFFECTS/RATIONALE:
LOSS OF VEHICLE POWER FOR IV OPERATIONS. PROBABLE EARLY USE OF BATTERY POWER WILL IMPACT MISSION DURATION. POSSIBLE MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-316
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
FLIGHT: 2/1R
MDAC ID: 418

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY POWER TO FAN AND TO DC/DC CONVERTER (T5 OPEN) - STICKS IN T4 POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES - UNABLE TO CHANGE SWITCH POSITION

EFFECTS/RATIONALE:
LOSS OF BATTERY POWERED FAN/PUMP/SEPARATOR AND DC/DC CONVERTER CAUSES MISSION TERMINATION. IF EVA, POSSIBLE CREWPERSON LOSS IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-317
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 419

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR FAN POWER AND DC/DC CONVERTER (T6 OPEN)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACUERES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES—UNABLE TO CHANGE SWITCH POSITION

EFFECTS/RATIONALE:
LOSS OF VEHICLE POWER FOR IV OPERATIONS. PROBABLY EARLY USE OF BATTERY POWER WILL IMPACT MISSION.
LOSS OF BATTERY POWERED FAN/PUMP/SEPARATOR AND DC/DC CONVERTER CAUSES MISSION TERMINATION. IF EVA, POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-318
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 420

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN (T1 OPEN)-STICKS IN T2 POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778596-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES-UNABLE TO CHANGE POSITION OF SWITCH, OPPOSITE CONTACT WELDS CLOSED

EFFECTS/RATIONALE:
LOSS OF VEHICLE POWER FOR EVC, CLIV, AND FEEDWATER VALVE. PROBABLE EARLY USE OF BATTERY TO OPERATE THESE ITEMS DURING IV OPERATIONS. POSSIBLE MISSION DURATION IMPACT DUE TO EARLY BATTERY USE.

REFERENCES:

REPORT DATE 12/02/86  C-319
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 421

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY POWER TO EVC (T2 OPEN)—STICKS IN T1 POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV778596-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES—UNABLE TO CHANGE POSITION OF SWITCH, OPPOSITE CONTACT WELDS CLOSED

EFFECTS/RATIONALE:
LOSS OF BATTERY POWER FOR EVC, CLIV, AND FEEDWATER VALVE. UNABLE TO PERFORM EVA DUE TO COOLING LOSS. MISSION TERMINATION. SOP USAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-320
# INDEPENDENT ORBITER ASSESSMENT
## ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 10/10/86  
**HIGHEST CRITICALITY** HDW/FUNC  
**FLIGHT:** 2/1R

**ITEM:** POWER MODE SELECTOR SWITCH (ITEM 364)  
**FAILURE MODE:** SWITCH FAILS OPEN FOR CONTACT TO EVC POWER (T3 OPEN)

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU  
2) LSS  
3) DCM

**CRITICALITIES**

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**LOCATION:**
**PART NUMBER:** SV778596-2

**CAUSES:** HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES—UNABLE TO CHANGE POSITION OF SWITCH, RELAY FRACTURES

**EFFECTS/RATIONALE:**
LOSS OF VEHICLE POWER FOR EVC, CLIV, AND FEEDWATER VALVE. LOSS OF BATTERY FOR EVC, CLIV, AND FEEDWATER VALVE. UNABLE TO PERFORM EVA. MISSION TERMINATION. SOP USEAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

**REFERENCES:**

---

**REPORT DATE 12/02/86**  
**C-321**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86          HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 423

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH STAYS IN VEHICLE POWER POSITION

LEAD ANALYST: G. RAFFAELLI   SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV778596-2

CAUSES: SWITCH MECHANISM JAMS/FRACTURES

EFFECTS/RATIONALE:
UNABLE TO OBTAIN BATTERY POSITION. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86   C-322
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 424

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH STAYS IN BATTERY POWER POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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8) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778596-2

CAUSES: SWITCH MECHANISM JAMS/FRACTURES

EFFECTS/RATIONALE:
UNABLE TO OBTAIN VEHICLE POWER POSITION TO CHARGE BATTERY OR PERFORM IV OPERATIONS. POSSIBLE MISSION IMPACT DUE TO EARLY BATTERY USEAGE. MISSION TERMINATION IF BATTERY REQUIRES ADDITIONAL CHARGE.

REFERENCES:

REPORT DATE 12/02/86 C-323
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 425

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SHORT-VEHICLE POWER (ANY CONTACT) TO GROUND

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 3/3
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV778596-2

CAUSES: CONTAMINATION, VIBRATION/WIRE CHAFFING

EFFECTS/RATIONALE:
UNABLE TO USE EMU ON VEHICLE POWER DURING ANY IV OPERATIONS.
EARLY BATTERY POWER USE IMPACTS MISSION DURATION.

REFERENCES:

REPORT DATE 12/02/86 C-324
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86                HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU                FLIGHT: 2/1R
MDAC ID: 426

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SHORT-BATTERY POWER (ANY CONTACT) TO GROUND

LEAD ANALYST: G. RAFFAELLI    SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV778596-2

CAUSES: CONTAMINATION, VIBRATION/WIRE CHAFFING

EFFECTS/RATIONALE:
UNABLE TO EMPLOY BATTERY FOR EVA. DISCHARGE OF BATTERY POWER.
MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS WHEN EVA.

REFERENCES:

REPORT DATE 12/02/86 C-325
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC FLIGHT: 3/2R
SUBSYSTEM: EMU  MDAC ID: 427

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)  FAILURE MODE: OPEN IN PTT POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION, VIBRATION FRACTURES CONTACT JOINT

EFFECTS/RATIONALE:
UNABLE TO EMPLOY PTT POSITION. MISSION TERMINATION DUE TO COMMUNICATIONS FAILURE IF EITHER OTHER POSITION FAILS.

REFERENCES:

REPORT DATE 12/02/86  C-326
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 428

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: OPEN IN VOX POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION, VIBRATION FRACTURES CONTACT JOINT

EFFECTS/RATIONALE:
UNABLE TO EMPLOY VOX POSITION. MISSION TERMINATION DUE TO COMMUNICATIONS FAILURE IF PTT POSITION FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-327
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86   HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 429

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: OPEN IN RECEIVE POSITION

LEAD ANALYST: G. RAFFAELLI   SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 5) 6) 7) 8) 9)

CRITICALITIES

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LOCATION:
PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION, VIBRATION FRACTURES CONTACT JOINT

EFFECTS/RATIONALE:
UNABLE TO RECEIVE ONLY. MISSION TERMINATION WILL RESULT WITH A VOX POSITION FAILURE.

REFERENCES:

REPORT DATE 12/02/86 C-328
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 430

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: SHORT IN PTT POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

LOCATION: PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION, WIRE CHAFFING DUE TO VIBRATION CORROSION

EFFECTS/RATIONALE:
UNABLE TO USE PTT POSITION. MOMENTARY (YET SMALL) INCREASE IN POWER CONSUMPTION. MISSION TERMINATION DUE TO COMMUNICATIONS LOSS IF VOX FAILURE ALSO OCCURS.

REFERENCES:

REPORT DATE 12/02/86  C-329
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 431  FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: SHORT IN RECEIVE POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV767794-1

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION, WIRE
CHAFFING DUE TO VIBRATION CORROSION

EFFECTS/RATIONALE:
UNABLE TO USE RECEIVE POSITION. INCREASE IN POWER CONSUMPTION
OCCURS. MISSION TERMINATION RESULTS IF COMMUNICATIONS ARE LOST
WITH FAILURE OF VOX POSITION ALSO.

REFERENCES:

REPORT DATE 12/02/86  C-330
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  10/10/86  
SUBSYSTEM:  EMU  
MDAC ID:  432  
HIGHEST CRITICALITY  
HDW/FUNC  
FLIGHT:  3/2R  

ITEM:  PUSH-TO-TALK SWITCH (ITEM 365)  
FAILURE MODE:  SHORT IN VOX POSITION  

LEAD ANALYST:  G. RAFFAELLI  
SUBSYS LEAD:  G. RAFFAELLI  

BREAKDOWN HIERARCHY:  
1)  EMU  
2)  LSS  
3)  DCM  
4)  
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CRITICALITIES  
FLIGHT PHASE  
HDW/FUNC  
PRE-EVA:  3/2R  
EVA:  3/2R  
POST-EVA:  3/2R  

REDUNDANCY SCREENS:  
A [ 2 ]  
B [ P ]  
C [ P ]  

LOCATION:  
PART NUMBER:  SV767794-1  

CAUSES:  HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION, WIRE CHAFFING DUE TO VIBRATION, CORROSION  

EFFECTS/RATIONALE:  
UNABLE TO USE VOX POSITION. INCREASE IN POWER CONSUMPTION OCCURS. MISSION TERMINATION DUE TO COMMUNICATIONS FAILURE RESULTS IF PTT ALSO FAILS.  

REFERENCES:  

REPORT DATE  12/02/86  C-331
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: PUSH-TO-TALK SWITCH (ITEM 365)  
FAILURE MODE: FAIL CLOSED IN VOX POSITION

LEAD ANALYST: G. RAFFAELLI  
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU  
2) LSS  
3) DCM

CRITICALITIES
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LOCATION:  
PART NUMBER: SV767794-1

CAUSES: SPRING FRACTURE JAMS MECHANISM, CAM BINDS, BEARING BINDS

EFFECTS/RATIONALE:  
UNABLE TO DISABLE VOICE COMMUNICATIONS. NO IMPACTS.

REFERENCES:

REPORT DATE 12/02/86  
C-332
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 434

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: FAIL CLOSED IN RECEIVE POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV767794-1

CAUSES: SPRING FRACTURE JAMS MECHANISM, CAM BINDS, BEARING BINDS

EFFECTS/RATIONALE:
UNABLE TO OBTAIN VOICE COMMUNICATIONS. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-333
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  
SUBSYSTEM: EMU  
MDAC ID: 435  
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/2

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)  
FAILURE MODE: FAIL CLOSED IN PTT POSITION

LEAD ANALYST: G. RAFFAELLI  
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU  
2) LSS  
3) DCM  
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CRITICALITIES

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REDUNDANCY SCREENS:

LOCATION:
PART NUMBER: SV767794-1

CAUSES: SPRING FRACTURE JAMS MECHANISM, CAM BINDS, BEARING BINDS, LATCH FAILURE

EFFECTS/RATIONALE:
UNABLE TO DISABLE VOICE COMMUNICATION. MISSION TERMINATION DUE TO INABILITY TO RECEIVE COMMUNICATIONS.

REFERENCES:

REPORT DATE 12/02/86  C-334
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 436

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: SWITCH FAILS OPEN ALL POSITIONS

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767794-1

CAUSES: MECHANISM FAILURE BETWEEN CONTACTS, HERMETIC SEAL FAILURE CAUSING CONTAMINATION AND CORROSION

EFFECTS/RATIONALE:
UNABLE TO OBTAIN ANY COMMUNICATIONS VIA THE EVC. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-335
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 437

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: FAN POWER ON CONTACT OPEN/FAILS OFF

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION, CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE/RELAY FRACTURED

EFFECTS/RATIONALE:
UNABLE TO POWER FAN MOTOR. MISSION TERMINATION. SOP USEAGE REQUIRED IF EVA. LOSS OF CREWPERSOON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-336
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 438

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: FAN POWER ON CONTACT SHORT TO GROUND

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION ACROSS CONTACTS, SWITCH MECHANISM FRACTURES ACROSS CONTACTS

EFFECTS/RATIONALE:
LOSS OF AVAILABLE POWER TO MOTOR. HIGH USE RATE OF BATTERY POWER. SOP USAGE REQUIRED IF EVA. MISSION IMPACT/TERMINATION. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-337
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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REDUNDANCY SCREENS:  

LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION, CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:
UNABLE TO OPEN CLIV. UNABLE TO CHARGE/RECHARGE EMU. MISSION TERMINATION WOULD RESULT. (THE VALVE IS ONLY PLACED TO THE "OPEN" POSITION PRIOR TO EVA). DURING EVA, SINCE THE VALVE IS NOT SPRING LOADED, AN OPEN WOULD HAVE NO EFFECT.

REFERENCES:

REPORT DATE 12/02/86  C-338
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
FLIGHT: 3/2R
MDAC ID: 440

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: CLIV POWER "CLOSE" LINE/CONTACT OPEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/3
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION, CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:
VALVE REMAINS OPEN. NO IMMEDIATE IMPACT UNLESS A SECOND FAILURE (THE 134 CHECK VALVE COULD FAIL OPEN) RESULTS TO ALLOW FLOODING OF VENT LOOP DURING CHARGING. IF THIS OCCURRED, THE PLANNED OR FUTURE EVA MISSIONS WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-339
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 441

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: CLIV POWER SHORT TO GROUND

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION TO CAUSE A SHORT, VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:
THE POWER TO THE CLIV IS CURRENT-LIMITED AND SHOULD LIGHTLY LOAD THE BATTERY. SUCH A SHORT CAN RESULT IN THE CLIV BEING STUCK IN POSITION, THE WORST OF WHICH IS CLOSED, THEREBY INHIBITING LCG CHARGING/RECHARGING FOR THE PRE OR POST EVA. THE MISSION WILL BE TERMINATED. IF EVA, A FAILURE OF THE LCG PRESSURE INTEGRITY CAN RESULT IN DEGRADED COOLING AND MISSION TERMINATION DUE TO INABILITY TO MAKE-UP H2O. MISSION DURATION CAN BE IMPACTED DUE TO THE SLIGHTLY HIGHER POWER USEAGE.

REFERENCES:

REPORT DATE 12/02/86  C-340
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 442

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: FAN POWER SHORT TO GROUND

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION ACROSS LEADS, VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:
LOSS OF FAN MOTOR ASSEMBLY. INCREASED DEMAND ON BATTERY POWER. SOP USEAGE REQUIRED IF EVA. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON WITH SOP FAILURE IF EVA.

REFERENCES:

REPORT DATE 12/02/86  C-341
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 443

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: SWITCH FAILS OFF

LEAD ANALYST: G. RAFFAElli SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV771887-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR FAILS/FRACTURES

EFFECTS/RATIONALE:
NO POWER AVAILABLE TO FAN OR VALVE. MISSION TERMINATION. IF EVA, SOP USEAGE REQUIRED AND POSSIBLE LOSS OF CREWPERSON WITH FAILURE OF SOP.

REFERENCES:

REPORT DATE 12/02/86 C-342
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 444
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: SWITCH FAILS ON

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3


LOCATION:
PART NUMBER: SV771887-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR FAILS/FRACTURES

EFFECTS/RATIONALE:
MISSION CAN BE PERFORMED BUT ON/OFF CAPABILITY OF SWITCH WILL BE VIA CONNECTION/DISCONNECTION OF SCU POWER.

REFERENCES:

REPORT DATE 12/02/86 C-343
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 445

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL OPEN ON FEEDWATER OPEN LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION,
CONTACT FRACURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:
FEEDWATER VALVE REMAINS CLOSED. NO COOLING AVAILABLE TO THE
CREWPERSON. IF DETECTED PRE-EVA OR POST-EVA MISSION TERMINATION
RESULTS. IF EVA, MISSION IS TERMINATED AND POSSIBLE LOSS OF
CREWPERSON CAN RESULT IF SOP ALSO FAILS.

REFERENCES:
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 446

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/2

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL OPEN ON FEEDWATER CLOSE LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION,
CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:
WORST CASE IS FOR POST-EVA WHEN THE SUBLIMATOR, UNABLE TO CLOSE,
CAN BE FLOODED RESULTING IN POSSIBLE LOSS OF FUTURE MISSIONS.

REFERENCES:

REPORT DATE 12/02/86 C-345
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 447

HIGHEST CRITICALITY HDW/FUNC

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL SHORT ON FEEDWATER OPEN LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION ACROSS LEADS, VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:
POWER IS CURRENT LIMITED. VALVE OPERATION IS PROBABLY IMPAIRED. VALVE MAY REMAIN CLOSED. MISSION TERMINATION. IF OCCURRENCE OF FAILED CLOSED OR SHORT IS TO "CLOSED" LINE IS DURING EVA, THE EMU WILL LOSE ALL COOLING AND POSSIBLE LOSS OF CREWPERSON CAN RESULT IF SOP ALSO FAILS. POSSIBLE MISSION DURATION IMPACT DUE TO HIGHER THAN NORMAL USE OF BATTERY POWER.

REFERENCES:

REPORT DATE 12/02/86 C-346 C-5
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 448
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL SHORT ON FEEDWATER CLOSE LINE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSE CONTAMINATION ACROSS LEADS, VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:
POWER IS CURRENT LIMITED. VALVE OPERATION IS PROBABLY IMPAIRED SUCH THAT VALVE MAY REMAIN OPEN CAUSING POST-EVA SUBLIMATOR FLOODING AND TERMINATION OF FUTURE MISSION. IF SHORT IS TO OPEN LINE SUBLIMATOR MAY BE FLOODED PRE-EVA RESULTING IN MISSION TERMINATION. IF CURRENT LIMITER FAILS, HIGHER THAN NORMAL USE OF BATTERY POWER COULD REDUCE MISSION DURATION.

REFERENCES:

REPORT DATE 12/02/86  C-347
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 449

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV767795-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR FAILS/FRACTURES

EFFECTS/RATIONALE:
UNABLE TO PERFORM EMU COOLING VIA SUBLIMATOR. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS DURING THE EVA.

REFERENCES:

REPORT DATE 12/02/86 C-348
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY  HDW/FUNC FLIGHT: 2/2
SUBSYSTEM: EMU  MDAC ID: 450

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
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7) 
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 3/3
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767795-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR FAILS/FRACTURES

EFFECTS/RATIONALE:
OPEN POSITION IS ACCEPTABLE FOR EVA; HOWEVER, IN THE AIRLOCK THIS FAILURE CAN RESULT IN FLOODING THE SUBLIMATOR AND MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-349
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 451

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: OPEN IN STATUS LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION ON CONTACTS, CONTACT FRACTURED DUE TO VIBRATION

EFFECTS/RATIONALE:
UNABLE TO OBTAIN CAUTION AND WARNING STATUS AND LOSS OF VISUAL MISSION STATUS. MISSION TERMINATION DUE TO THESE LOSSES RESULTS.

REFERENCES:

REPORT DATE 12/02/86 C-350
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 452

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/2

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: OPEN IN PROGRAM LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 5) 6) 7) 8) 9)

CRITICALITIES

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LOCATION:
PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION ON CONTACTS, CONTACT FRACTURED DUE TO VIBRATION

EFFECTS/RATIONALE:
UNABLE TO EMPLOY LOGIC PROGRAM FOR IV OPERATIONS. ALSO, UNABLE TO ACKNOWLEDGE CAUTION AND WARNING SIGNAL THEREBY MAINTAINING HIGHEST PRIORITY SIGNAL ON DISPLAY AND POSSIBLY MASKING OTHER SIGNALS.

REFERENCES:

REPORT DATE 12/02/86 C-351
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 453

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: SHORT TO GROUND IN STATUS LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION/COOROSION
CAUSING SHORT, WIRE CHAFFING, VIBRATION

EFFECTS/RATIONALE:
SHORT IN THE SWITCH WILL RESULT IN THE DC-DC CONVERTER (WHICH
PROVIDES THE POWER) SHUTTING DOWN. THIS WILL DEPRIVE THE MAJORITY
OF THE EMU OF POWER AND MONITORING. POSSIBLE LOSS OF CREWPERSON
CAN RESULT IF SOP FAILS DURING EVA.

REFERENCES:

REPORT DATE 12/02/86 C-352
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
FLIGHT: 2/1R
MDAC ID: 454

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: SHORT TO GROUND IN PROGRAM LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION/COOROSION
CAUSING SHORT, WIRE CHAFFING, VIBRATION

EFFECTS/RATIONALE:
SHORT IN THE SWITCH WILL RESULT IN THE DC-DC CONVERTER (WHICH
PROVIDES THE POWER) SHUTTING DOWN. THIS WILL DEPRIVE THE MAJORITY
OF THE EMU OF POWER AND MONITORING. POSSIBLE LOSS OF CREWPERSON
CAN RESULT IF SOP FAILS DURING EVA.

REFERENCES:

REPORT DATE 12/02/86 C-353
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 455

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: BEARING FAILS IN "STATUS" POSITION

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV767792-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION

EFFECTS/RATIONALE:
UNABLE TO EMPLOY PROGRAM FOR IV OPERATIONS. ALSO UNABLE TO
ACKNOWLEDGE CAUTION AND WARNING THEREBY MAINTAINING HIGHEST
PRIORITY SIGNAL ON DISPLAY AND POSSIBLY MASKING OTHER SIGNALS.
TERMINATE MISSION.

REFERENCES:

REPORT DATE 12/02/86  C-354
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 456

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: SWITCH FAILS IN "PROGRAM" POSITION

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV767792-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION

EFFECTS/RATIONALE:
UNABLE TO OBTAIN CAUTION AND WARNING AND MISSION STATUS. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-355
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 457

HIGHEST CRITICALITY HDW/FUNC

ITEM: BITE INDICATOR (ITEM 363)
FAILURE MODE: OPEN IN ELECTRICAL INPUT/FAILED OFF

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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REdundancy Screens: A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER: SV722651

CAUSES: CORROSION, FRACTURED CONTACT TO LIGHT SOURCE

EFFECTS/RATIONALE:
WILL RESULT IN NO LIGHT INDICATION OF CAUTION AND WARNING
FAILURE. A TONE MAY OCCUR BUT THIS TOO CAN BE CONSTRUED AS A
FAILURE BY THE CREWPERSON. IF DETECTED, THE MISSION SHOULD
TERMINATE.
(NOTE: THE BITE LITE IS TO BE DELETED IN THE FUTURE, IF THIS
OCCURS NO IMPACT WILL RESULT OTHER THAN GREATER DEPENDENCE UPON
THE TONE.)

REFERENCES:

REPORT DATE 12/02/86  C-356
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 458
FLIGHT: 2/2

ITEM: BITE INDICATOR (ITEM 363)
FAILURE MODE: SHORT TO BITE INDICATOR CIRCUIT/FAILED ON

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV722651

CAUSES: CONTAMINATION ACROSS CONTACTS, FAILED ELECTRONICS

EFFECTS/RATIONALE:
CONTINUOUS LIGHT ON INDICATING CAUTION AND WARNING FAILURE;
HOWEVER, IT IS NOT ACCOMPANIED BY THE TONE. SINCE FAILURE IS NOT
ISOLABLE AND MAY MASK A TRUE FAILURE, THE MISSION SHOULD BE
TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-357
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/2
MDAC ID: 459

ITEM: ALPHANUMERIC DISPLAY (ITEM 369)
FAILURE MODE: SUPPLY VOLTAGE (VCC) OPEN TO ALL THREE
CHIPS/DISPLAY FAILS OFF TOTALLY

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV791145-1&2

CAUSES: VIBRATION/FRACTURING, CORROSION, PIN-CONTACT FAILURE,
THERMAL CYCLING DUE TO HEAT SINK FAILURE

EFFECTS/RATIONALE:
LOSS OF ENTIRE DISPLAY FOR IV AND MISSION OPERATIONS AND CAUTION
AND WARNING. TONES REMAIN. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-358
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 460

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: ALPHANUMERIC DISPLAY (ITEM 369)
FAILURE MODE: ERRATIC DISPLAY/LED DRIVER OR COLUMN DRIVER FAILURE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV791145-1&2

CAUSES: THERMAL DAMAGE TO ELECTRONICS DUE TO HEAT SINK FAILURE, VIBRATION, CORROSION ON INPUT CONTACTS, OPEN ON CLOCK SIGNAL, DATA IN CONTACT OPEN/CORRODED

EFFECTS/RATIONALE:
LOSS OF ONE OR MORE OF THE THREE PARTS OF THE DISPLAY CAN BE
EQUATED TO A NON-USEABLE DISPLAY AND, THEREFORE, MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-359
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 461

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: DISPLAY I/O PORT FAILS OFF

LEAD ANALYST: G. RAFFAELE  SUBSYS LEAD: G. RAFFAELE

BREAKDOWN HIERARCHY:
1) EMU
2) C&W
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REDUNDANCY SCREENS:  A [ ]   B [ ]   C [ ]

LOCATION:
PART NUMBER: SV785970-5

CAUSES: ELECTRONICS FAILURE, VIBRATION/CORROSION, THERMAL CYCLING CAUSES FAILURE

EFFECTS/RATIONALE:
LOSS OF DISPLAY CAPABILITY FOR CAUTION AND WARNING. TONE GENERATOR REMAINS. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-360
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/2
MDAC ID: 462

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: MEMORY 5.V POWER-IN FAILURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) C&W
3) 
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV785970-5

CAUSES: VIBRATION CAUSES OPEN, THERMAL CYCLING STRESS ELECTRONICS, SHORT DUE TO CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF MEMORY USE FOR CAUTION AND WARNING AND CPU IMPACT.
POSSIBLE LOSS OF CAUTION AND WARNING FUNCTION. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-361
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 10/16/86

**SUBSYSTEM:** EMU

**MDAC ID:** 463

**HIGHEST CRITICALITY:** HDW/FUNC

**FLIGHT:** 2/2

**ITEM:** CAUTION AND WARNING ELECTRONICS (ITEM 150)

**FAILURE MODE:** SYSTEM CLOCK OUTPUT OPEN

**LEAD ANALYST:** G. RAFFAELLI

**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**

1) EMU
2) C&W
3) 
4) 
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6) 
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**CRITICALITIES**

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**REDUNDANCY SCREENS:** A [ ]   B [ ]   C [ ]

**LOCATION:**

**PART NUMBER:** SV785970-5

**CAUSES:** THERMAL CYCLING CAUSES OPEN, VIBRATION, CORROSION

**EFFECTS/RATIONALE:**

CAUTION AND WARNING CPU FAILURE. MISSION TERMINATION.

**REFERENCES:**

**REPORT DATE 12/02/86**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 464

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: MULTIPLEXER INPUT POWER FAILURE

LEAD Analyst: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) C&W
3)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV785970-5

CAUSES: THERMAL CYCLING CAUSES OPEN, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF MOST DATA MONITORED/SENSED IN EMU. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-363
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 465

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: ANALOG TO DIGITAL CONVERTER FAILURE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) C&W
3)
4)
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9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV785970-5

CAUSES: ELECTRONICS FAILURE, THERMAL CYCLING STRESSES ELECTRONICS, REFERENCE VOLTAGE INPUT SHORTS/OPENS

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO DETERMINE ENGINEERING UNITS FOR VARIOUS ANALOG PARAMETERS AND THEIR SUBSEQUENT DISPLAY USEAGE AND CAUTION AND WARNING USEAGE. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-364
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 466

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: BITE CIRCUIT FAILS ON

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) C&W
3) 
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV785970-5

CAUSES: VIBRATION CAUSES SHORT, ELECTRONICS FAILURE,
CONTAMINATION CAUSES SHORT

EFFECTS/RATIONALE:
BITE LITE ON WITHOUT ACCOMPANYING TONE. THIS WILL REQUIRE
JUDGMENT CALL BY CREwperson TO DETERMINE FAILURE. MAY POSSIBLY
MASK SUBSEQUENT FAILURE. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-365
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT:  2/2
MDAC ID: 467

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: BITE CIRCUIT FAILS OFF

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) C&W
3)  
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER: SV785970-5

CAUSES: OPEN IN CIRCUITRY, ELECTRONICS FAILURE, CORROSION

EFFECTS/RATIONALE:
IF THE CIRCUIT WERE REQUIRED, THE TONE GENERATOR WOULD ANNUNCIATE ITSELF BUT NOT BE ACCOMPANIED BY THE BITE LITE OR A FAILURE MESSAGE WILL REQUIRE A CREWPERSON JUDGMENT CALL REGARDING FAILURE. MISSION TERMINATION WOULD RESULT.

REFERENCES:

REPORT DATE 12/02/86  C-366
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 468

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: UART FAILS

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) C&W
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV785970-5

CAUSES: THERMAL CYCLING CAUSES OPEN, VIBRATION CAUSES OPEN, CORROSION

EFFECTS/RATIONALE:
LOSS OF C&W RTDS DATA INTERFACE. NO IMPACT.

REFERENCES:

REPORT DATE 12/02/86 C-367
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/3
MDAC ID: 469

ITEM: DCM ELECTRONICS  FAILURE MODE: OPEN IN CURRENT SENSE LINE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU
2) LSS
3) DCM
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CORROSION, VIBRATION

EFFECTS/RATIONALE:
NO IMPACTS. LOSS OF C&W CURRENT MONITORING CAPABILITY.

REFERENCES:

REPORT DATE 12/02/86  C-368
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 10/16/86  
**HIGHEST CRITICALITY** HDW/FUNC

**SUBSYSTEM:** EMU  
**MDAC ID:** 470  
**FLIGHT:** 3/2R

**ITEM:** DCM ELECTRONICS  
**FAILURE MODE:** SHORT IN CURRENT SENSE TO GROUND

**LEAD ANALYST:** G. RAFFAELLI  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU  
2) LSS  
3) DCM

**REDUNDANCY SCREENS:** A [ ]  B [ P ]  C [ P ]

**LOCATION:**
**PART NUMBER:** SV792291

**CAUSES:** THERMAL CYCLING, CONTAMINATION, VIBRATION

**EFFECTS/RATIONALE:**
SMALL INCREASE IN LOAD ON BATTERY CAN RESULT IN POSSIBLE IMPACT TO MISSION DURATION. LOSS OF C&W CURRENT MONITORING CAPABILITY. IF BATTERY IS DRAWN DOWN, MISSION TERMINATION WILL RESULT.

**REFERENCES:**

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**CRITICALITIES**

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**REPORT DATE 12/02/86**  
**C-369**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 471

HIGHEST CRITICALITY
HDW/FUNC

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CORROSION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF VOLTAGE MONITORING CAPABILITY. NO IMPACTS.

REFERENCES:

REPORT DATE 12/02/86  C-370
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 472

HIGHEST CRITICALITY HDW/FUNC

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN VOLTAGE SENSE LINE TO GROUND

LEAD ANALYST: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF VOLTAGE MONITORING CAPABILITY. SMALL LOAD MAY EFFECT BATTERY FOR MISSION DURATION. MISSION TERMINATION IF BATTERY FAILS ALSO.

REFERENCES:

REPORT DATE 12/02/86 C-371
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 473
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EMI FILTER SHORTS TO GROUND

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV792291

CAUSES: WIRE CHAFFING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
SCU POWER-IN IS CURRENT LIMITED FROM THE ORBITER AND CIRCUIT
PROTECTED. LOSS OF SCU POWER TO EMU IS THE RESULT. EARLY USEAGE
OF BATTERY POWER IS NECESSARY TO PERFORM MISSION ALTHOUGH EARLY
USE CAN IMPACT MISSION DURATION.
SPARE BATTERY AVAILABLE FOR USE IF FULL MISSION DURATION
REQUIRED. IF SPARE IS FAILED, THE MISSION IS PROBABLE IMPACTED.

REFERENCES:

REPORT DATE 12/02/86 C-372
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 474

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EMI FILTER OPEN ELECTRICALLY

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF SCU POWER TO EMU. EARLY USEAGE OF BATTERY POWER IS NECESSARY TO PERFORM MISSION ALTHOUGH EARLY USE CAN IMPACT MISSION DURATION. SPARE BATTERY AVAILABLE FOR USE IF FULL MISSION DURATION REQUIRED.
IF SPARE IS FAILED MISSION IS PROBABLY IMPACTED.

REFERENCES:

REPORT DATE 12/02/86 C-373
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 475
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV-CURRENT LIMITER SHORTS TO GROUND AT INLET

LEAD ANALYST: G. RAFFAELLI        SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
SHORT IMPOSED ON SCU/BATTERY POWER INLET CAUSING INCREASED LOAD ON SOURCE AND LOSS OF EVC PRIMARY CURRENT LIMITER & THE CLIV POWER FOR POSITION CHANGE. MISSION TERMINATION. IF EVA, INCREASED LOAD ON BATTERY WHEN COMBINED WITH AN SOP FAILURE CAN RESULT IN LOSS OF VENT LOOP AND LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-374
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 476

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV CURRENT LIMITER SHORTS TO GROUND
AT EVC PRI POWER OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
SHORT RESULTS IN CURRENT LIMITATION OCCURRING ON OUTLET AND LOSS
OF EVC PRI POWER. MISSION TERMINATES IF EVC SEC FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-375
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 477

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORTS TO GROUND AT INLET

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
SHORT ON SCU/BATTERY POWER INLET CAUSES INCREASED LOAD ON SOURCE AND LOSS OF THE EVC SECONDARY AND POWER FOR FEEDWATER VALVE POSITION CHANGE. MISSION TERMINATION. IF EVA, INCREASED LOAD ON BATTERY, WHEN COMBINED WITH AN SOP FAILURE, CAN RESULT IN LOSS OF VENT LOOP AND LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-376
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 478

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORTS TO GROUND AT EVC SEC POWER

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
SHORT RESULTS IN CURRENT LIMITATION ON OUTLET AND LOSS OF EVC SEC POWER. MISSION TERMINATES IF EVC PRI FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-377
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 479
FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV CURRENT LIMITER SHORTS TO GROUND
AT CLIV POWER OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
SHORT RESULTS IN CURRENT LIMITATION ON OUTLET AND LOSS OF CLIV POWER. CLIV FAIL IN POWER. WORST-CASE POSITION IS CLOSED IN THAT NO MAKEUP WATER TO LCG IS AVAILABLE, SUCH THAT OVER THE MISSION, COOLING EFFICIENCY DECREASES AS LCG BECOMES FULL DEGASSSED. MISSION TERMINATION. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS DURING EVA.

REFERENCES:

REPORT DATE 12/02/86  C-378
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 480
FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORTS TO GROUND AT FEEDWATER VALVE POWER OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF COOLING FUNCTION OF SUBLIMATOR IF VALVE IS CLOSED.
MISSION TERMINATION. POSSIBLE CREWPERSON LOSS WITH LOSS OF SOP DURING EVA.

REFERENCES:

REPORT DATE 12/02/86 C-379
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 481

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRI/CLIV CURRENT LIMITER HAS ELECTRICAL OPEN
ON POWER IN OR POWER OUT LINE FOR CLIV

LEAD ANALYST: G. RAFFAElli
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) ...
5) ...
6) ...
7) ...
8) ...
9) ...

CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF CLIV OPERATIONAL CAPABILITY. IF CLOSED, MISSION MUST
TERMINATE AND LCG CANNOT BE CHARGED/RECHARGED. IF EVA; THE CLIV
IS NORMALLY OPEN TO PROVIDE MAKEUP WATER TO THE LCG; BUT IF IT
HAD FAILED CLOSED, GRADUAL COOLING LOSS WOULD RESULT IN MISSION
TERMINATION AND POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-380
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 482

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER HAS ELECTRICAL OPEN ON EVC SEC POWER OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF EVC SEC POWER. MISSION IMPACT IF EVC PRI POWER FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-381
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 483
FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER HAS ELECTRICAL OPEN ON FEEDWATER VALVE POWER IN/OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

C RITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
INABILITY TO CHANGE FEEDWATER VALVE POSITION. IF PRE-EVA, MISSION TERMINATED DUE TO NO EVA COOLING CAPABILITY. IF EVA, LOSS OF FEEDWATER CONTROL TO OPEN WOULD RESULT IN MISSION TERMINATION AND POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.
IF POST-EVA, BEING UNABLE TO CLOSE VALVE CAN CAUSE THE SUBLIMATOR AND VENT LOOP TO FLOOD.

REFERENCES:

REPORT DATE 12/02/86  C-382
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/2R

SUBSYSTEM: EMU
MDAC ID: 484

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV CURRENT LIMITER HAS ELECTRICAL OPEN ON EVC PRI POWER OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF EVC PRIMARY POWER. MISSION TERMINATION IF EVC SEC POWER ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-383
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 485

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: OPEN IN POWER IN TO DC/DC CONVERTER TAP T1

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4)
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9)

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF 18 VOLT OUTPUT AND 3.8-VOLT OUTPUT. 18 VOLT OUTPUT IS NOT USED. THE 3.8V OUTPUT LOSS WOULD RESULT IN LOSS OF THE DISPLAY COLUMN DRIVERS AND THEREFORE THE DISPLAY. MISSION TERMINATION WOULD RESULT. ALSO, THIS LOSS WOULD FAIL THE SUIT PRESSURE GAGE LIGHT AND THE BITE INDICATOR LIGHT.

REFERENCES:

REPORT DATE 12/02/86 C-384
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 486

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: OPEN IN POWER IN TO DC/DC CONVERTER TQP T3

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/Func
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF +14.2V, 12V, 5.6V, AND 5.0V OUTPUTS. IMMEDIATE LOSS OF STATUS FOR FEEDWATER VALVE, FAN, VEHICLE POWER AND BATTERY POWER, AND BITE; ALSO, LOSS OF DISPLAY CONTROL AND VARIOUS TRANSDUCERS AND SENSORS, THE RTDS, AND VARIOUS OTHER SENSE CIRCUITS. MAJOR LOSS OF INSTRUMENTATION AND CAUTION AND WARNING. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-385
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86

SUBSYSTEM: EMU

MDAC ID: 487

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/2

ITEM: DCM ELECTRONICS (ITEM 350)

FAILURE MODE: OPEN IN POWER IN TO DC/DC CONVERTER TAP 2

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:

PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF DC/DC CONVERTER FUNCTION WHICH SUPPORTS THE DCM ELECTRONICS CWS, RTDS, DISPLAY, AND MONITORING. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-386
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86

SUBSYSTEM: EMU

MDAC ID: 488

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT TO GROUND IN ANY DC/DC CONVERTER INPUT LINE (DOWNSTREAM OF CONVERTER CURRENT LIMITER)

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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8) 
9) 

CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:

PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
CURRENT LIMITING TO DC/DC CONVERTER RESULTS WITH LOSS OF CONVERTER FUNCTION WHILE CONSTANT RATE OF DRAIN ON BATTERY OCCURS. MISSION TERMINATION. POSSIBLE CREWPERSON LOSS IF POWER DEGRADES AND SOP ALSO FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-387
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 489

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT TO GROUND AT INPUT OF DC/DC CONVERTER CURRENT LIMITER
LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
DRAIN ON SCU/BATTERY POWER SOURCE. DEGRADATION OF DC/DC CONVERTER FUNCTION SUCH THAT FUNCTION IS IN EFFECT LOST. MISSION TERMINATION. POSSIBLE CREWPERSON LOSS IF BATTERY FAILS AND SOP IS ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-388
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 490

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT TO GROUND ON DC/DC CONVERTER 5V DC OUT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF DISPLAY DUE TO LOSS (DEGRADATION) OF 5V POWER TO COLUMN DRIVERS AND LOGIC. WITH NO DISPLAY AVAILABLE MISSION TERMINATION IS REQUIRED. ALSO, CONVERTER WILL SHUT DOWN DUE TO CURRENT DRAW.

REFERENCES:

REPORT DATE 12/02/86 C-389
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 491

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN DC/DC CONVERTER 5V DC OUT

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF DISPLAY DUE TO LOSS (DEGRADATION) OF 5V POWER TO COLUMN
DRIVERS AND DISPLAY LOGIC. WITH NO DISPLAY AVAILABLE MISSION
TERMINATION IS REQUIRED.

REFERENCES:

REPORT DATE 12/02/86  C-390
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 492

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN +14.2V OUT (FROM DC/DC CONVERTER)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF C&W REFERENCE VOLTAGE AND POWER FOR VARIOUS C&W BUFFERS, MULTIPLEXERS, AND SENSORS. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86
C-391
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86                      HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU                      FLIGHT: 2/2
MDAC ID: 493

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN 3.8V OUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF DISPLAY DUE TO FAILURE/DEGRADATION OF POWER TO DISPLAY COLUMN DRIVERS. ALSO, LOSS OF SUIT PRESSURE GAGE LIGHT AND BITE INDICATOR. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86    C-392
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 494

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN 3.8V OUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF DISPLAY DUE TO FAILURE/DEGRADATION OF POWER TO DISPLAY COLUMN DRIVERS. ALSO, LOSS OF SUIT PRESSURE GAGE LIGHT AND BITE INDICATOR. MISSION TERMINATION. CONVERTER SHUTDOWN DUE TO CURRENT LIMITER TRIP.

REFERENCES:

REPORT DATE 12/02/86 C-393
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 495

HIGHEST CRITICALITY

FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN +14.2V OUT (FROM DC/DC CONVERTER)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

LEAD: G. RAFFAELLI

HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
LOSS/DEGRADATION OF C&W REFERENCE VOLTAGE AND POWER FOR VARIOUS C&W BUFFERS, MULTIPLEXERS, AND SENSORS. MISSION TERMINATION. ALSO, THE CONVERTER WILL SHUTDOWN DUE TO CURRENT LIMITER TRIP.

REFERENCES:

REPORT DATE 12/02/86 C-394
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 496

HIGHEST CRITICALITY HDW/FUNC

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN 18V OUTPUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
4) 5) 6) 7) 8) 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CONTAMINATION VIBRATION

EFFECTS/RATIONALE:
18-VOLT OUTPUT IS NOT USED IN DCM ELECTRONICS.

REFERENCES:

REPORT DATE 12/02/86 C-395
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 497
HIGHEST CRITICALITY HDW/FUNC

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN 18V OUTPUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES

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<td>POST-EVA:</td>
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
CONVERTER SHUTDOWN DUE TO CURRENT LIMITER TRIP. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-396
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86   HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU   FLIGHT: 2/2
MDAC ID: 498

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN LINE TO TONE GENERATOR

LEAD ANALYST: G. RAFFAElli  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CORROSION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF WARNING TONES AND STATUS TONES. MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-397
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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<td>SUBSYS LEAD:</td>
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**REDUNDANCY SCREENS:** A [ ] B [ ] C [ ]

**LOCATION:**

PART NUMBER: SV792291

**CAUSES:** ELECTRONICS FAILURE

**EFFECTS/RATIONALE:**

CONSTANT TONES TO CREWPERSON WILL CAUSE MISSION TERMINATION DUE TO CREWMEMBER DISCOMFORT.

**REFERENCES:**

REPORT DATE 12/02/86 C-398
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 500

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: COOLING CONTROL VALVE (ITEM 321)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2

REDUNDANCY SCREENS:

LOCATION:
PART NUMBER: SV789693

CAUSES: HOUSING SEAL FAILURE, SEAL FAILURE TO COOLANT LOOPS

EFFECTS/RATIONALE:
DURING PRE- AND POST-EVA, LOSS OF COOLANT WATER RESULTS IN
INSUFFICIENT COOLING AND POSSIBLE DIFFICULTY IN CHARGE/RECHARGE
OPERATIONS. DURING EVA, LOSS OF COOLANT WATER RESULTS IN A LIKE
LOSS OF FEWATER (DUE TO MAKEUP REQUIREMENTS) UNTIL SUPPLY IS
EXHAUSTED. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF
EVA. POSSIBLE CREWPERSON LOSS IF SOP FAILS.

REFERENCES:

REPORT DATE 12/02/86 C-399
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID:  501

ITEM: COOLING CONTROL VALVE (ITEM 321)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES

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LOCATION:
PART NUMBER: SV789693

CAUSES: SPOOL SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HIGH-FIDELITY COOLING CONTROL. POSSIBLE CREWPERSON DISCOMFORT. POSSIBLE MISSION TERMINATION. IF HEAT LOAD TOO HIGH, CREWPERSON MAY REQUIRE USE OF SOP. POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

REPORT DATE 12/02/86  C-400
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 502

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: COOLING CONTROL VALVE (ITEM 321)
FAILURE MODE: JAMS FULL COLD OR FULL HOT

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) DCM
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: SV789693

CAUSES: CONTAMINATION OR CORROSION ON STEM/DRUM

EFFECTS/RATIONALE:
CREWPERSON SUBJECTED TO FULL COLD OR MAJOR LOSS OF COOLING.
MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP IF EVA.

REFERENCES:

REPORT DATE 12/02/86 C-401
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86

SUBSYSTEM: EMU
MDAC ID: 503

HIGHEST CRITICALITY HDW/FUNC

ITEM: SHEAR PLATE ASSEMBLY (115)
FAILURE MODE: "IV" POSITION SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:

PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY

EFFECTS/RATIONALE:
UNABLE TO EMPLOY IV PROGRAM SEQUENCE WHICH WOULD TRIGGER ON THIS INDICATOR. VISUAL INSPECTION AND PRESSURE VALVES AVAILABLE. NO MISSION IMPACT. EVA POSITION IS DETERMINED VIA A DIFFERENT SWITCH.

REFERENCES:

REPORT DATE 12/02/86 C-402
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 504

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY (115)
FAILURE MODE: "OFF" POSITION SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAElli SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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6) 
7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY

EFFECTS/RATIONALE:
UNABLE TO VERIFY BY POSITION SWITCH, ACTUATOR IN OFF POSITION.
VISUAL INSPECTION AND GRADUAL PRESSURE DECAY WOULD SO INDICATE
THE POSITION.

REFERENCES:

REPORT DATE 12/02/86 C-403
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 505

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: SHEAR PLATE ASSEMBLY (115)
FAILURE MODE: "PRESS" POSITION SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
4) 
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7) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/3

REDUNDANCY SCREENS:

LOCATION:

PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY

EFFECTS/RATIONALE:
PRESS POSITION WOULD BE VERIFIABLE VISUALLY AND BY SUIT PRESSURE VALUE; HOWEVER, FAILURE TO OPEN WOULD IMPACT EMU CAPABILITY TO PERFORM THE LEAK CHECK FOR PRESSURE INTEGRITY. ALSO, IV PROGRAMMED OPERATIONS WILL BE IMPACTED. POSSIBLE MISSION IMPACT IF SUIT LEAKS.

REFERENCES:

REPORT DATE 12/02/86 C-404
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 506

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: IV POSITION SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY/FRACTURES, LEAD CHAFFES OPEN

EFFECTS/RATIONALE: SIGNAL WILL APPEAR TO ELECTRONICS AS IF IN "PRESS" POSITION WHEN IN "OFF" POSITION. NO IMPACT TO LEAK CHECK IN PRESS, ALTHOUGH IT MAY CAUSE ERRORS IN IV PROGRAMMED OPERATIONS. EVA POSITION IS BY AN ALTERNATE SWITCH. VISUAL VERIFICATIONS AVAILABLE IN ADDITION TO PRESSURE VALUES.

REFERENCES:

REPORT DATE 12/02/86 C-405
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 507

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: OFF POSITION SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS

CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY/FRACTURES, LEAD CHAFFES OPEN

EFFECTS/RATIONALE:
SIGNAL WILL APPEAR TO ELECTRONICS AS IF IN "PRESS" POSITION WHEN IN "IV" POSITION. POSSIBLE IV PREPROGRAMMED OPERATIONS ERRORS MAY RESULT. LEAK CHECK IN PRESS POSITION WOULD STILL BE VALID.

REFERENCES:

REPORT DATE 12/02/86 C-406
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 508

HIGHEST CRITICALITY HDW/FUNC

ITEM: SHEAR PLATE ASSEMBLY
FAILUDE MODE: PRESS POSITION SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) PLSS
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:

PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY/FRACTURES, LEAD CHAFFES OPEN

EFFECTS/RATIONALE:
UNABLE TO PERFORM IV PROGRAMMED SEQUENCES APPLICABLE TO IV POSITION. NO IMPACT TO OBTAINING POSITIONS FOR REGULATOR. NO MISSION IMPACT.

REFERENCES:

REPORT DATE 12/02/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 509

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: +14V HL REGULATOR FAILS HIGH/LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:

PART NUMBER:

CAUSES: ELECTRONICS OPEN, CONTAMINATION, SHORT

EFFECTS/RATIONALE:
LOSS OF HANDLING COMMUNICATIONS. REQUIRES LOSS OF REDUNDANT
RADIO COMMUNICATIONS FOR LOSS OF MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-408
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 510

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: +14V A, BU REGULATOR FAILS HIGH/LOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, CONTAMINATION, SHORT

EFFECTS/RATIONALE:
LOSS OF ONE TRANSMITTER/RECEIVER SET. IF REDUNDANT SETS FAIL, MISSION IS TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-409
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 511

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: +14V B REGULATOR FAILS HIGH/LOW

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS

CRITICALITIES

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LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, CONTAMINATION, SHORT

EFFECTS/RATIONALE:
LOSS OF ONE TRANSMITTER/RECEIVER SET. IF REDUNDANT SETS FAIL, MISSION IS TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-410
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 512

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: MODE A/BACKUP TRANSMITTER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER:

CAUSES: INTERNAL TRANSMITTER, ELECTRONICS FAIL OPEN, ELECTRICAL SHORT, RELAY TO ANTENNA FAILS OPEN

EFFECTS/RATIONALE:
IF REDUNDANT TRANSMITTER WERE TO ALSO FAIL, MISSION WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-411
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 513

HIGHEST CRITICALITY HDW/FUNC

ITEM: EVC
FAILURE MODE: MODE B/TRANSMITTER, LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS

CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:

PART NUMBER:

CAUSES: INTERNAL TRANSMITTER, ELECTRONICS FAIL OPEN, ELECTRICAL SHORT, RELAY TO ANTENNA FAILS OPEN

EFFECTS/RATIONALE:
IF REDUNDANT TRANSMITTER WERE TO ALSO FAIL, MISSION WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-412
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 514

ITEM: EVC
FAILURE MODE: 296.8 MHZ RECEIVER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS

CRITICALITIES

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<td>POST-EVA:</td>
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LOCATION:
PART NUMBER:

CAUSES: ELECTRONIC OPEN, ELECTRICAL SHORT, LOSS OF POWER

EFFECTS/RATIONALE:
IF REDUNDANT RECEIVERS WERE ALSO LOST, MISSION WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-413
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 515

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: 259.7 MHZ RECEIVER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS
4) 
5) 
6) 
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9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRICAL SHORT, MUTE LATCH FAILS CLOSED FOR TRANSMITTER, LOSS OF POWER

EFFECTS/RATIONALE:
IF REDUNDANT RECEIVERS WERE ALSO LOST, MISSION WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-414
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 516
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: 279.0 MHZ RECEIVER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS
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LOCATION:

PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRICAL SHORT, LOSS OF POWER

EFFECTS/RATIONALE:
IF REDUNDANT RECEIVERS WERE ALSO LOST, MISSION WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-415
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 517

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: ANTENNA
FAILURE MODE: LOSS OF SIGNAL (ANY ONE OF THREE)

LEAD ANALYST: G. RAFFAELLI
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) LSS
3) EVCS

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R


LOCATION:
PART NUMBER:

CAUSES: ELECTRICAL OPEN

EFFECTS/RATIONALE:
NO IMPACT FOR SINGLE FAILURE. LOSS OF OTHER REDUNDANT TRANSMIT OR RECIEVE FUNCTIONS WILL RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-416
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:          HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU                    FLIGHT: 2/2
MDAC ID: 600

ITEM: NECK RING AND VENT SEAL ASSEMBLY
FAILURE MODE: JAM OF LOCK MECHANISM (CANNOT MATE TO HELMET FROM NECK RING 1)

LEAD ANALYST: J. WHITMAN          SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
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CRITICALITIES

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LOCATION:
PART NUMBER: A/L 9357-10/9713-03

CAUSES: BROKEN/LOOSENED SPRING IN LOCK. MECHANISM, MATERIAL CAUGHT IN MECHANISM) MISALIGNED LOCKING PINS.

EFFECTS/RATIONALE:
IF CANNOT MATE EVA, MISSION IS TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-417
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [Redacted]
SUBSYSTEM: EMU
MDAC ID: 601

HIGHEST CRITICALITY
HDW/FUNC: [Redacted]

FLIGHT: 2/2

ITEM: NECK RING AND VENT SEAL ASSEMBLY
FAILURE MODE: JAM OF LOCK MECHANISM (CANNOT DEMATE HELMET FROM NECK RING)

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
4) [Redacted]
5) [Redacted]
6) [Redacted]
7) [Redacted]
8) [Redacted]
9) [Redacted]

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: /
POST-EVA: 2/2


LOCATION:
PART NUMBER: A/L 9357-10/9713-03

CAUSES: FAULTY SPRING IN LOCK MECHANISM, MATERIAL CAUGHT IN MECHANISM, MISALIGNED LOCKING PINS.

EFFECTS/RATIONALE:
DEMATE CAN BE FORCED OR SUIT DOFFED WITHOUT HELMET REMOVAL, SUBSEQUENT MISSIONS PROBABLY TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-418
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: .................................................. HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM:  EMU .................................. FLIGHT:  2/1R
MDAC ID:  602 ........................................

ITEM: NECK RING AND VENT SEAL ASSEMBLY
FAILURE MODE: LEAKAGE OF NECK RING.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
4) ........................................
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8) ........................................
9) ........................................

CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA:  2/2
EVA:  2/1R
POST-EVA:  2/2


LOCATION:
PART NUMBER:  A/L 9357-10/9713-03

CAUSES:  FAULTY OR ERODED LIP SEALS OR GASKETS, MISINGALIZED OR MISSING SCREWS

EFFECTS/RATIONALE:
IF LEAKAGE OUT OF MAKE UP TOLERANCE MISSION WOULD BE TERMINATED. IF LEAK LARGE ENOUGH WITH A CONCURRENT SOP FAILURE, CREWPERSON POSSIBLY LOST.

REFERENCES:

REPORT DATE 12/02/86  C-419
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [ ]

SUBSYSTEM: EMU

MDAC ID: 603

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 1/1

ITEM: NECK RING AND VENT SEAL ASSEMBLY

FAILURE MODE: NECK RING FAILURE

LEAD ANALYST: J. WHITMAN

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

1) EMU
2) SSA
3) HUT
4) [ ]
5) [ ]
6) [ ]
7) [ ]
8) [ ]
9) [ ]

CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:

PART NUMBER: A/L 9357-10/9713-03

CAUSES: BROKEN/LOOSENED SPRING, BROKEN LOCKING PINS.

EFFECTS/RATIONALE:

IF THIS FAILURE WERE TO OCCUR EVA IT WOULD RESULT IN LOSS OF CREWPERSON DUE TO PROBABLE LARGE LEAK EXCEEDING SOP MAKEUP CAPABILITY.

REFERENCES:

REPORT DATE 12/02/86 C-420
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM: EMU  
MDAC ID: 604  

HIGHEST CRITICALITY   HDW/FUNC  
FLIGHT: 2/1R  

ITEM: WATER LINE AND VENT TUBE ASSMEBLY  
FAILURE MODE: WATER FLOWN BLOCKAGE.  

LEAD ANALYST: J. WHITMAN  
SUBSYS LEAD: G. RAFFAELLI  

BREAKDOWN HIERARCHY:  
1) EMU  
2) SSA  
3) HUT  
4)  
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7)  
8)  
9)  

CRITICALITIES  
FLIGHT PHASE  HDW/FUNC  
PRE-EVA: 2/2  
EVA: 2/1R  
POST-EVA: 2/2  


LOCATION:  
PART NUMBER: 0102-82437-18  

CAUSES: MATERIAL IN LINES, CONTAMINATION  

EFFECTS/RATIONALE:  
BLOCKAGE COULD CAUSE MISSION TERMINATION DUE TO DEGRADATION OF COOLING FOR CREWPERSON. POSSIBLE SOP USEAGE REQUIRED. POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP.  

REFERENCES:  

REPORT DATE 12/02/86  C-421
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [Blank]

SUBSYSTEM: EMU
MDAC ID: 605

ITEM: WATER LINE AND VENT TUBE ASSEMBLY
FAILURE MODE: WATER LINE LEAKAGE.

LEAD ANALYST: J. WHITMAN

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
4) [Blank]
5) [Blank]
6) [Blank]
7) [Blank]
8) [Blank]
9) [Blank]

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0102-82437-18

CAUSES: FAULTY TUBING OR SEALS.

EFFECTS/RATIONALE:
LOSS OF FEEDWATER CAPACITY RESULTS IN LOSS OF COOLING. PROBABLE SOP USEAGE REQUIRED. ADDITIONALLY, WATER IN THE SUIT COULD RESULT IN BLOCKAGE OF THE PURGE VALVES BY ICE FORMATION THEREBY INHIBITING SOP OPERATION. IF SOP WERE REQUIRED AND THE VALVES WERE BLOCKED, POSSIBLE LOSS OF CREWPERSON WOULD RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-422
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [Blank]
SUBSYSTEM: EMU
MDAC ID: 606

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: WATER LINE AND VENT TUBE ASSMEBLY
FAILURE MODE: 02 LEAKAGE DIRECTLY TO HUT.

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
4) [Blank]
5) [Blank]
6) [Blank]
7) [Blank]
8) [Blank]
9) [Blank]

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 2/1R
POST-EVA: 3/3


LOCATION:
PART NUMBER: 0102-82437-18

CAUSES: DEFECTIVE O RINGS, ERODED TUBING, IMPROPER BONDING AT FLANGE MOUNT.

EFFECTS/RATIONALE:
POSSIBLE DEGRADATION OF ORAL-NASAL FLUSH CAN RESULT IN HIGH LEVEL
OF HUMIDITY AND CO2 IN CREWPERSONS ORAL NASAL AREA. IF CREWPERSON
DOES NOT DETECT CO2 BUILDUP (THEY ARE TAUGHT THE SYMPTOMS),
POSSIBLE CREWPERSON LOSS CAN RESULT.
(NO ALTERNATE/REDUNDANT PATH EXISTS).

REFERENCES:

REPORT DATE 12/02/86 C-423
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU
MDAC ID: 607

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3

ITEM: MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: LEAKAGE WHEN UNMATED TO LCVG HALF OF CONNECTOR.

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: /NA
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9694-08

CAUSES: O-RINGS OR POPPETS DEFECTIVE, MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:
LEAKAGE OF WATER INTO AIRLOCK. REQUIRES USAGE OF MORE WATER FOR RECHARGE.

REFERENCES:

REPORT DATE 12/02/86 C-424
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/2
MDAC ID: 608

ITEM: MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: JAM. FAIL TO MATE WITH LCVG HALF OF CONNECTOR.

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAPPAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9694-08

CAUSES: BROKEN/LOOSENED RING LATCH IN LOCK POSITION, MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:
MISSION TERMINATION DUE TO INABILITY TO MATE LCVG TO HUT.

REFERENCES:

REPORT DATE 12/02/86 C-425
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                     HIGHEST CRITICALITY   HDW/FUNC
SUBSYSTEM: EMU            FLIGHT: 2/2
MDAC ID:  609
ITEM:    MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: JAM. FAIL TO DEMATE WITH LCVG HALF OF CONNECTOR.
LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI
BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
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9) 

CRITICALITIES
FLIGHT PHASE   HDW/FUNC
PRE-EVA:  3/3
EVA:   /NA
POST-EVA:  2/2

REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER:  A/L 9694-08

CAUSES: MATERIAL IN COUPLING MECHANISM

EFFECTS/RATIONALE:
WOULD HAVE TO BE FORCED OPEN. POSSIBLE TERMINATION OF SUBSEQUENT MISSIONS IF DAMAGE OCCURS DURING OPENING.

REFERENCES:

REPORT DATE 12/02/86  C-426
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM: EMU  
MDAC ID: 610

HIGHEST CRITICALITY  HDW/FUNC
FLIGHT: 2/1R

ITEM: MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: LEAKAGE-MATED.

LEAD ANALYST: J. WHITMAN  
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU  
2) SSA  
3) HUT  
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2  
EVA: 2/1R  
POST-EVA: 2/2


LOCATION:
PART NUMBER: A/L 9694-08

CAUSES: CUT O-RINGS, DEFECTIVE SURFACE FOR SEALING OF SPRING.

EFFECTS/RATIONALE:
IF DISCOVERED PRE OR POST EVA, WOULD TERMINATE UPCOMING AND
SUBSEQUENT MISSIONS. IF EVA, GRADUAL H2O LOSS CAN CAUSE WATER TO
MIGRATE TO AND FAIL THE VENT LOOP. SOP USEAGE WOULD THEN BE
REQUIRED; HOWEVER THE PURGE VALVES COULD BE BLOCKED BY ICE DUE TO
THE FREE WATER. IF THIS OCCURS, POSSIBLE LOSS OF CREWPERSON COULD
RESULT.

REFERENCES:

REPORT DATE 12/02/86  C-427
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                                HIGHEST CRITICALITY
SUBSYSTEM: EMU                        HDW/FUNC
MDAC ID: 611                          FLIGHT: 2/1R

ITEM: HARD UPPER TORSO SHELL
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
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CRITICALITIES

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LOCATION:
PART NUMBER: SV772375-21

CAUSES: DEFECTIVE MATERIALS, DAMAGE

EFFECTS/RATIONALE:
LOSS OF PRIMARY PRESSURE MAINTENANCE VIA THE PLSS COULD RESULT IN SOP USEAGE. IF THE SOP FAILS, CREWPERSON COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86 C-428
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU
MDAC ID: 612

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: HARD UPPER TORSO SHELL
FAILURE MODE: UNABLE TO MATE EEH. TO CCA

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV772375-21

CAUSES: IMPROPER BONDING, BAD MATERIALS.

EFFECTS/RATIONALE:
TERMINATE MISSION IF UNABLE TO MATE TO CCA DUE TO LOSS OF COMMUNICATIONS.

REFERENCES:

REPORT DATE 12/02/86 C-429
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: EMU
MDAC ID: 613

ITEM: GIMBAL ASSY.
FAILURE MODE: DISATTACHMENT OF PIVOTS.

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
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CRITICALITIES

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<td>POST-EVA:</td>
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: SV772302-1/SV772308-5

CAUSES: DEFECTIVE MATERIAL, DAMAGING IMPACTS.

EFFECTS/RATIONALE:
IF DISSATTACHMENT OCCURS EVA, ARMS COULD SEPARATE FROM HUT AND RAPID SOP DEPLETION WOULD OCCUR WITH LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-430
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [ ]
SUBSYSTEM: EMU
MDAC ID: 614

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: BELLOWS ASSEMBLY
FAILURE MODE: LEAKAGE.

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0102-82438-16

CAUSES: DEFECTIVE ATTACHMENT, IMPACT DAMAGE.

EFFECTS/RATIONALE:
LOSS OF PRESSURE INTEGRITY. LEAKAGE OF PRIMARY O2 SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR SIMULTANEOUS SOP FAILURE OCCURS, POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-431
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                  HIGHEST CRITICALITY
SUBSYSTEM:  EMU        HDW/FUNC
MDAC ID:   615          FLIGHT:  2/1R

ITEM:    BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE:  LEAKAGE.

LEAD ANALYST: J. WHITMAN          SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:  
1)  EMU
2)  SSA
3)  HUT
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA:  2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER:  A/L 9786-05

CAUSES:  DAMAGE, DETERIORATING O-RING, MATERIAL CAUGHT IN INTERFACE, DAMAGE DUE TO IMPACT.

EFFECTS/RATIONALE:
LOSS OF PRESSURE INTEGRITY. LEAKAGE OF PRIMARY 02 SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR SIMULTANEOUS SOP FAILURE OCCURS, CREWMEMBER COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86    C-432
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU 
MDAC ID: 616 

ITEM: BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE: FAILURE TO MATE.

LEAD ANALYST: J. WHITMAN 
SUBSYS LEAD: G. RAFFAEULLI 

BREAKDOWN HIERARCHY:
1) EMU 
2) SSA 
3) HUT 
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2 
EVA: /NA 
POST-EVA: 3/3 

REDUNDANCY SCREENS: A [ ] 
B [ ] 
C [ ] 

LOCATION: 
PART NUMBER: A/L 9786-05 

CAUSES: MATERIAL IN MECHANISM, MISALIGNED LOCKING PINS, BROKEN/LOOSE SPRING. 

EFFECTS/RATIONALE:
INABILITY TO MATE HUT TO LTA RESULTS IN MISSION TERMINATION. 

REFERENCES: 

REPORT DATE 12/02/86 
C-433
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU
MDAC ID: 617

ITEM: BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE: FAILURE TO DEMATE.

LEAD ANALYST: J. WHITMAN      SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
4) BODY SEAL CLOSURE (HUT SIDE)
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: A/L 9786-05

CAUSES: MATERIAL IN MECHANISM, UNEVEN LOADS ON HALFS OF MECHANISM, BROKEN/LOOSENED SPRING DEVICE.

EFFECTS/RATIONALE:
WOULD HAVE TO BE FORCED OPEN RESULTING IN PROBABLE DAMAGE TO MECHANISM. TERMINATION OF SUBSEQUENT MISSIONS.

REFERENCES:

REPORT DATE 12/02/86      C-434
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                    HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU            FLIGHT: 1/1
MDAC ID: 618

ITEM: BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE: LOCK MECHANISM FAILURE-OPEN

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
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LOCATION:
PART NUMBER: A/L 9786-05

CAUSES: DAMAGE OR DEFECTIVE LOCKING MECHANISM.

EFFECTS/RATIONALE:
IF FAILURE OCCURRED EVA RESULTING LEAKAGE WOULD DEPLETE PRIMARY 02 SUPPLY AND WOULD LIKELY EXCEED SOP CAPABILITY TO MAKEUP LOST OXYGEN. PROBABLE LOSS OF CREWPERSON. MISSION TERMINATION IF PRE OR POST EVA.

REFERENCES:

REPORT DATE 12/02/86  C-435
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [ ]
SUBSYSTEM: EMU
MDAC ID: 619

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3

ITEM: HARNESS STRAP AND HARNESS PAD ASSEMBLY
FAILURE MODE: DISLOCATION OF STRAP AND/OR PAD ASSEMBLY

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HUT
4) [ ]
5) [ ]
6) [ ]
7) [ ]
8) [ ]
9) [ ]

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0102-82718-09/10; 0102-82717-01/02

CAUSES: MATERIALS OR ATTACHMENT FAILURE.

EFFECTS/RATIONALE:
THIS DEVICE IS MAINLY FOR 1-G EXERCISES AND WETF. OFTEN NOT USED IN ACTUAL FLIGHT. NO IMPACT.

REFERENCES:

REPORT DATE 12/02/86 
C-436
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM:  EMU  
MDAC ID:  620  

HIGHEST CRITICALITY  HDW/FUNC  FLIGHT:  3/2R

ITEM:  COMBINATION PURGE VALVE
FAILURE MODE:  FAIL CLOSED.

LEAD ANALYST:  J. WHITMAN  
SUBSYS LEAD:  G. RAFFAELLI

BREAKDOWN HIERARCHY:
1)  EMU
2)  SSA
3)  HELMET
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CRITICALITIES

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LOCATION:
PART NUMBER:  A/L 9819-07

CAUSES:  MECHANISM DAMAGED, BAD O-RINGS, SCREW DAMAGED OR SEATED IMPROPERLY, OUTSIDE MATERIAL IN MECHANISM, CORROSION.

EFFECTS/RATIONALE:
IF SIMULTANEOUS CPV AND DCM PURGE VALVE FAILURES OCCUR MISSION SHOULD BE TERMINATED DUE TO LOSS OF PURGE CAPABILITY EMPLOYING THE SOP.

REFERENCES:

REPORT DATE 12/02/86  C-437
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU 
MDAC ID: 621

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: COMBINATION PURGE VALVE
FAILURE MODE: FAIL OPEN/INTERNAL LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HELMET
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LOCATION:
PART NUMBER: A/L 9819-07

CAUSES: MECHANISM DAMAGED, BAD 0-RINGS, SCREW DAMAGED OR SEATED IMPROPERLY, OUTSIDE MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:
IF CPV WERE TO FAIL OPEN EVA IT WOULD RESULT IN MISSION TERMINATION AND DEPLETION OF PRIMARY 02 SYSTEM REQUIRING SOP USEAGE. IF SOP IS FAILED, POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-438
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU
MDAC ID: 622

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: HELMET ASSEMBLY
FAILURE MODE: LEAKAGE.

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HELMET
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CRITICALITIES

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LOCATION:
PART NUMBER: A/L 9672-01

CAUSES: IMPACT TO HELMET, IMPROPER SEATING OF HELMET TO NECK RING.

EFFECTS/RATIONALE:
IF LEAKAGE EXCEEDS PRIMARY 02 SYSTEM AND SOP MAKEUP OR HAVE SIMULTANEOUS SOP FAILURE WITH DEPLETION OF PRIMARY SYSTEM, COULD ENDANGER CREWMEMBERS.

REFERENCES:

REPORT DATE 12/02/86 C-439
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU
MDAC ID: 623

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: EXTRAVEHICULAR VISOR ASSEMBLY
FAILURE MODE: JAM OF SUN VISOR (SUN VISORS) IN OPEN POSITION

LEAD ANALYST: J. WHITMAN 
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) HELMET
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9813-12

CAUSES: WARPED EVVA SHELL, IMPACT DAMAGE, MATERIAL TRAPPED IN MECHANISM.

EFFECTS/RATIONALE:
POSSIBLE MISSION TERMINATION DUE TO INABILITY OF CREWPERSON TO SEE IN BRIGHT SUN.

REFERENCES:

REPORT DATE 12/02/86 C-440
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM: EMU  
MDAC ID: 624  

HIGHEST CRITICALITY HDW/FUNC  
FLIGHT: 3/3  

ITEM: EXTRAVEHICULAR VISOR ASSEMBLY  
FAILURE MODE: JAM OF SUN VISOR (SUN VISORS) IN CLOSED POSITION  

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU  
2) SSA  
3) HELMET  
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CRITICALITIES  
FLIGHT PHASE HDW/FUNC  
PRE-EVA: 3/3  
EVA: 3/3  
POST-EVA: 3/3  

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9813-12

CAUSES: WARPED EVVA SHELL, IMPACT DAMAGE, MATERIAL TRAPPED IN MECHANISM.

EFFECTS/RATIONALE:
NO IMPACTS TO MISSION.

REFERENCES:

REPORT DATE 12/02/86  
C-441
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM: EMU  
MDAC ID: 625  

ITEM: EXTRAVEHICULAR VISOR ASSEMBLY  
FAILURE MODE: CRACK IN SUN VISOR (SUN VISORS)  

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU  
2) SSA  
3) HELMET  
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9813-12

CAUSES: IMPACT DAMAGE.

EFFECTS/RATIONALE:
POSSIBLE MISSION TERMINATION DUE TO IMPAIRED ABILITY OF CREWPERSON TO SEE IN BRIGHT SUN.

REFERENCES:

REPORT DATE 12/02/86 C-442
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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**SUBSYSTEM:** EMU  
**MDAC ID:** 626

**ITEM:** EXTRAVEHICULAR VISOR ASSEMBLY  
**FAILURE MODE:** CRAZING (SCRATCHING) IN GOLD SUN VISOR

**LEAD ANALYST:** J. WHITMAN  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU  
2) SSA  
3) HELMET

**CRITICALITIES**

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**REDUNDANCY SCREENS:**  
A [ ]  
B [ ]  
C [ ]

**LOCATION:**
**PART NUMBER:** A/L 9813-12

**CAUSES:** IMPACT DAMAGE.

**EFFECTS/RATIONALE:**
IMPAIRED MISSION DURING EVA AND POSSIBLE INCREASE OF UV LIGHT THROUGH VISOR WOULD RESULT IN MISSION TERMINATION.

**REFERENCES:**

---

REPORT DATE 12/02/86  
C-443
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM: EMU  
MDAC ID: 627  
HIGHEST CRITICALITY HDW/FUNC  
FLIGHT: 2/1R

ITEM: UPPER/LOWER ARM RESTRAINT AND BLADDER ASSEMBLY  
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN  
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY
4) 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0103-82318-22 0103-82351-16

CAUSES: PUNCTURE HOLE, DEFECTIVE MATERIAL, LOOSE/IMPROPERLY INSTALLED SCREWS AT FLANGE MOUNTS, MATERIAL TRAPPED IN FLANGE MOUNT.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE IS IN EXCESS OF SECONDARY OXYGEN SUPPLY OR IF SECONDARY OXYGEN SUPPLY IS LOST LEAKAGE WOULD RESULT IN LOSS OF CREWMEMBER.

REFERENCES:

REPORT DATE 12/02/86 C-444
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/1R
MDAC ID: 628

ITEM: UPPER/LOWER ARM RESTRAINT AND BLADDER ASSEMBLY
FAILURE MODE: LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY
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CRITICALITIES

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LOCATION:
PART NUMBER: 0103-82318-22 0103-82351-16

CAUSES: DEFECTIVE MATERIAL, TORN OR RIPPED RESTRAINT. LOOSE SET SCREW ALLOWING RESTRAINT TO UNSEAT BEFORE PRESSURIZATION

EFFECTS/RATIONALE:
IF SECONDARY RESTRAINT AND SOP ALSO LOST, COULD RESULT IN LOSS OF PRESSURE CONTAINMENT/MAKEUP AND CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-445
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                      HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 629
ITEM: SCYE BEARING ASSEMBLY
FAILURE MODE: LEAKAGE
LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: A/L 9782-04

CAUSES: SEPARATOR SEAL NOT FUNCTIONING PROPERLY, DAMAGED O-RINGS, FOREIGN MATTER IN MECHANISM.

EFFECTS/RATIONALE:
PROBABLE DEPLETION OF PRIMARY OXYGEN. IF LEAKAGE IS OUTSIDE SOP MAKEUP CAPABILITY OR SOP IS LOST, THEN CREWMEMBER MAY BE LOST IF EVA.

REFERENCES:

REPORT DATE 12/02/86 C-446
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU
MDAC ID: 630

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: SCYE BEARING ASSEMBLY
FAILURE MODE: BEARING TORQUES HIGH

LEAD ANALYST: J. WHITMAN 
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9782-04

CAUSES: ENVIRONMENTAL SEAL OUT OF TRACK. OVER LUBRICATION, FOREIGN MATTER IN THE MECHANISM.

EFFECTS/RATIONALE:
BEARING JAMS DUE TO HIGH TORQUE, SHOULDERS UNABLE TO ROTATE. CANCEL OR TERMINATE MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-447
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:               HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM:  EMU         FLIGHT:       2/1R
MDAC ID:     631

ITEM:     ARM BEARING ASSEMBLY
FAILRE MODE:  LEAKAGE

LEAD ANALYST:  J. WHITMAN          SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1)  EMU
2)  SSA
3)  ARM ASSEMBLY
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LOCATION:
PART NUMBER:  A/L 9657-06

CAUSES:  SEPARATOR SEAL NOT FUNCTIONING PROPERLY. DAMAGED O-RINGS, FOREIGN MATTER IN MECHANISM.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY 02. IF LEAKAGE EXCEEDS SOP MAKEUP OR SOP FAILS, THEN CREWMEMBER MAYBE LOST.

REFERENCES:

REPORT DATE 12/02/86          C-448
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [Blank] SUBSYSTEM: EMU MDAC ID: 632

ITEM: ARM BEARING ASSEMBLY FAILURE MODE: BEARING TORQUES HIGH

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY
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LOCATION:
PART NUMBER: A/L 9657-06

CAUSES: ENVIRONMENTAL SEAL OUT OF TRACK. OVER LUBRICATION FOREIGN MATTER IN THE MECHANISM.

EFFECTS/RATIONALE:
BEARING JAMS DUE TO HIGH TORQUE. ARMS UNABLE TO ROTATE. CANCEL OR TERMINATE MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-449
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: SUBSYSTEM: EMU
MDAC ID: 633  HIGHEST CRITICALITY HDW/FUNC

ITEM: WRIST DISCONNECT  FLIGHT: 2/2
FAILURE MODE: LOCK/JAM OPEN

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY

CRITICALITIES

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LOCATION:
PART NUMBER: A/L 9813–02 A/L 9814–02

CAUSES: FOREIGN MATERIAL IN MECHANISM. DEFECTIVE OR DAMAGED MECHANISM.

EFFECTS/RATIONALE:
A JAM IN OPEN POSITION WOULD CANCEL EVA MISSION DUE TO INABILITY TO DON SUIT.

REFERENCES:

REPORT DATE 12/02/86  C-450
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:   HIGHEST CRITICALITY      HDW/FUNC
SUBSYSTEM: EMU                    FLIGHT:           2/2
MDAC ID: 634

ITEM: WRIST DISCONNECT             FAILURE MODE: LOCK JAM CLOSED

LEAD ANALYST: J. WHITMAN          SUBSYS LEAD: G. RAFFAELELI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY
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CRITICALITIES

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LOCATION:
PART NUMBER: A/L 9813-02 A/L 9814-02

CAUSES: FOREIGN MATERIAL IN MECHANISM. DEFECTIVE OR DAMAGED MECHANISM.

EFFECTS/RATIONALE:
A JAM IN CLOSED POSITION WOULD CANCEL SUBSEQUENT EVA MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-451
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [Date]
SUBSYSTEM: EMU
MDAC ID: 635

ITEM: WRIST DISCONNECT
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY
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LOCATION:
PART NUMBER: A/L 9813-02 A/L 9814-02

CAUSES: SCREWS IMPROPERLY SEATED. DEFECTIVE O-RINGS. FOREIGN MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY 02 SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR SOP FAILS DURING EVA, POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-452
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: WRIST DISCONNECT
FAILURE MODE: LOCK FAILURE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) ARM ASSEMBLY
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LOCATION:
PART NUMBER: A/L 9813-02 A/L 9814-02

CAUSES: FOREIGN MATERIAL IN MECHANISM. DEFECTIVE OR DAMAGED LOCKING MECHANISM. MATERIAL FATIGUE.

EFFECTS/RATIONALE:
IF FAILURE WERE TO OCCUR DURING EVA GROSS LOSS OF OXYGEN AND PRESSURE RESULTS. LOSS OF CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-453
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                     HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU            FLIGHT: 2/2
MDAC ID: 637

ITEM: RERAINT MODIFIED
FAILURE MODE: RESTRAINT LAYER AND BLADDER SEPARATION

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) GLOVE ASSEMBLY
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CRITICALITIES

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LOCATION:
PART NUMBER: 0106-85894-11/12

CAUSES: DEFECTIVE ADHESION AT FINGER CAPS AND OR ATTACH POINTS.

EFFECTS/RATIONALE:
MISSION WOULD BE TERMINATED DUE TO TOTAL LOSS OF GLOVE FUNCTION.

REFERENCES:

REPORT DATE 12/02/86 C-454
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                      HIGHEST CRITICALITY
SUBSYSTEM:  EMU
MDAC ID:  638              HDW/FUNC

ITEM:  RESTRAINT MODIFIED
FAILURE MODE:  SIZING LINES IN FINGERS FAILED

LEAD ANALYST:  J. WHITMAN    SUBSYS LEAD:  G. RAFFAELLI

BREAKDOWN HIERARCHY:
1)  EMU
2)  SSA
3)  GLOVE ASSEMBLY
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LOCATION:
PART NUMBER:  0106-85894-11/12

CAUSES:  D

EFFECTS/RATIONALE:
SIZING OF GLOVES WOULD BE LOST AND LOSS OF CREWMEMBER DEXTERTY
WOULD TERMINATE OR IMPACT THE MISSION.

REFERENCES:

REPORT DATE 12/02/86  C-455
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: SUBSYSTEM: EMU
MDAC ID: 639

ITEM: RESTRAINT MODIFIED
FAILRE MODE: PALM BAR SEPARATED FROM POSITION.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) GLOVE ASSEMBLY
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0106-85894-11/12

CAUSES: RESTRAINT LOOP MATERIAL DAMAGED OR DEFECTIVE.

EFFECTS/RATIONALE:
COULD CAUSE LOSS OF GLOVE DEXTERITY AND CREWMEMBER DISCOMFORT, MISSION TERMINATION RESULTS.

REFERENCES:

REPORT DATE 12/02/86 C-456
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/1R
MDAC ID: 640

ITEM: RESTRAINT MODIFIED
FAILURE MODE: PRIMARY AXIAL RESTRAINT SEPARATED.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) GLOVE ASSEMBLY
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5)
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9)

CRITICALITIES

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LOCATION:
PART NUMBER: 0106-85894-11/12

CAUSES: DEFECTIVE, DAMAGED MATERIAL. SET SCREW IMPROPERLY SEATED.

EFFECTS/RATIONALE:
SECONDARY AXIAL RESTRAINT WILL TAKE LOAD IF PRIMARY FAILS. IF SECONDARY AXIAL RESTRAINTS FAIL, CREWMEMBER MAY BE LOST. MISSION IS TERMINATED IF FAILURE DETECTED.

REFERENCES:

REPORT DATE 12/02/86 C-457
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [Blank]
SUBSYSTEM: EMU
MDAC ID: 641

HIGHEST CRITICALITY HDW/FUNC

ITEM: BLADDER ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) GLOVE ASSEMBLY
4) [Blank]
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CRITICALITIES

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LOCATION:
PART NUMBER: 0106-87543-01/02

CAUSES: PUNCTURE, WEAR ON BLADDER AT FLANGE.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE OCCURS DURING EVA AND EXCEEDS THE SOP CAPACITY OR IF THE SOP FAILS, LOSS OF CREW MEMBER COULD RESULT.

REFERENCES:

REPORT DATE 12/02/86 C-458
INDDEPENDENT ORBITER ASSESSMENT
ORBTER SUBSYSTEM ANALYSIS WORKSHEET

DATE:...
SUBSYSTEM: EMU
MDAC ID: 642

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: WRIST DISCONNECT (GLOVE SIDE)
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) GLOVE ASSEMBLY
4) ...
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CRITICALITIES

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LOCATION:
PART NUMBER: AL 9924-01

CAUSES: IMPROPERLY SEATED OR DAMAGED SEALS, IMPROPERLY SEATED SCREWS. DEFECTIVE 0-RINGS. FOREIGN MATTER IN MECHANISM.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP CAPACITY OR SOP FAILS DURING EVA, LOSS OF CREW MEMBER IS POSSIBLE.

REFERENCES:

REPORT DATE 12/02/86 C-459
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM: EMU  
MDAC ID: 643  
HIGHEST CRITICALITY  
HDW/FUNC  
FLIGHT: 2/2  

ITEM: WRIST DISCONNECT (GLOVE SIDE)  
FAILURE MODE: BEARING TORQUE HIGH  

LEAD ANALYST: J. WHITMAN  
SUBSYS LEAD: G. RAFFAELLI  

BREAKDOWN HIERARCHY:  
1) EMU  
2) SSA  
3) GLOVE ASSEMBLY  
4)  
5)  
6)  
7)  
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9)  

CRITICALITIES  
FLIGHT PHASE HDW/FUNC  
PRE-EVA: 2/2  
EVA: 2/2  
POST-EVA: 2/2  

REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]  

LOCATION:  
PART NUMBER: AL 9924-01  

CAUSES: SEALS TORN. LUBRICATION OUT OF SPEC. BEARING OUT OF ROUND.  

EFFECTS/RATIONALE:  
BEARING COULD JAM. LIMITING WRIST MOVEMENT. MISSION TERMINATION.  

REFERENCES:  

REPORT DATE 12/02/86  
C-460
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  
SUBSYSTEM: EMU  
MDAC ID: 644  

HIGHEST CRITICALITY HDW/FUNC  
FLIGHT: 2/2

ITEM: PALM RESTRAINT  
FAILURE MODE: PALM BAR RESTRAINT SLIPPED

LEAD ANALYST: J. WHITMAN    SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) GLOVE ASSEMBLY
4)
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8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0106-23421-03/86059-01

CAUSES: MATERIAL FATIGUED

EFFECTS/RATIONALE:
IF PALM FIT IS COMPROMISED, EVA MISSION WOULD BE TERMINATED OR ADVERSELY AFFECTED.

REFERENCES:

REPORT DATE 12/02/86   C-461
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [ ]
SUBSYSTEM: EMU
MDAC ID: 645

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/2

ITEM: PALM RESTRAINT
FAILURE MODE: PALM BAR BENT

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) GLOVE ASSEMBLY
4) 
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8) 
9) 

CRITICALITIES

FLIGHT PHASE  HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0106-23421-03/86059-01

CAUSES: MATERIAL FATIGUED

EFFECTS/RATIONALE:
PALM BAR COULD PINCH CREWMEMBER'S HAND RESULTING IN MISSION TERMINATION OR IMPACT.

REFERENCES:

REPORT DATE 12/02/86 C-462
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  HIGHEST CRITICALITY  HDW/FUNC  FLIGHT:  2/1R
SUBSYSTEM: EMU  MDAC ID:  646

ITEM: WAIST RESTRAINT AND BLADDER
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
...

CRITICALITIES

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LOCATION:
PART NUMBER: 0104-82347-107 0104-84811-05

CAUSES: STITCH SEPARATION, PUNCTURE, FOREIGN MATERIAL TRAPPED AT FLANGE, LOOSE OR MISSEATED SCREWS AT FLANGE.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR IF SOP FAILS DURING EVA, THIS COULD CAUSE LOSS OF CREWMEMBER.

REFERENCES:

REPORT DATE 12/02/86  C-463
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                     HIGHEST CRITICALITY   HDW/FUNC
SUBSYSTEM: EMU    FLIGHT: 2/1R
MDAC ID: 647

ITEM: WAIST RESTRAINT AND BLADDER
FAILURE MODE: LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN        SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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9)

CRITICALITIES
FLIGHT PHASE   HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0104-82347-107 0104-84811-05

CAUSES: DEFECTIVE MATERIAL OR MANUFACTURE.

EFFECTS/RATIONALE:
SECONDARY AXIAL RESTRAINT IS THE REDUNDANT ITEM. FAILURE OF BOTH
OF THESE COULD RESULT IN LOSS OF CREWMEMBER DUE TO LOSS OF
STRUCTURAL INTEGRITY OF LTA (WAIST).

REFERENCES:

REPORT DATE 12/02/86 C-464
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: SUBSYSTEM: EMU MDAC ID: 648

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: WAIST BEARING FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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CRITICALITIES

FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: A/L 9698-08

CAUSES: MISSEATED SEAL, MISSEATED OR MISSING SCREWS, BAD O-RINGS, MISMATCH OF PRESSURE SEAL AND BEARING RACE WIDTHS.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN IF LEAKAGE EXCEEDS SOP MAKEUP OR SOP FAILS DURING EVA, POSSIBLE LOSS OF CREWMEMBER.

REFERENCES:

REPORT DATE 12/02/86 C-465
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: EMU
MDAC ID: 649
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: WAIST BEARING
FAILURE MODE: BEARING TORQUES HIGH

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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CRITICALITIES
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9698-08

CAUSES: FOREIGN MATERIAL IN MECHANISM, MISEATED SEALS, OR UNDER-LUBRICATION.

EFFECTS/RATIONALE:
BEARING TORQUES HIGH OR BEARING JAMMING RESULTS IN MISSION TERMINATION DUE TO DEGRADATION OF MOBILITY.

REFERENCES:

REPORT DATE 12/02/86 C-466
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU
MDAC ID: 650

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: LOWER TORSO RESTRAINT/BLADDER ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0104-82335-22

CAUSES: PUNCTURE OF BLADDER. SEAM SEPARATION OF BLADDER

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN-supply. IF LEAKAGE RATE EXCEEDS SOP
MAKEUP OR IF SOP FAILS DURING EVA, THIS COULD RESULT IN LOSS OF
CREWMEMBER.

REFERENCES:

REPORT DATE 12/02/86 C-467
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU FLIGHT: 2/1R
MDAC ID: 651
ITEM: LOWER TORSO RESTRAINT/BLADDER ASSEMBLY
FAILURE MODE: LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0104-82335-22

CAUSES: DEFECTIVE MATERIAL KEEPER SCREW MISSING FROM RESTRAINT BRACKET.

EFFECTS/RATIONALE:
SECONDARY AXIAL RESTRAINTS PROVIDE REDUNDANCY. FAILURE OF BOTH COULD RESULT IN LOSS OF CREWMEMBER DUE TO LOSS OF LTA STRUCTURAL INTEGRITY.

REFERENCES:

REPORT DATE 12/02/86 C-468
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:          HIGHEST CRITICALITY   HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/1R
MDAC ID: 652

ITEM:          FAILURE MODE:
BOOT DISCONNECT LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
4) 5) 6) 7) 8) 9)

CRITICALITIES

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LOCATION:
PART NUMBER: A/L 9752-01

CAUSES: DEFECTIVE O-RING MISSEATED SCREWS

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR SOP FAILS DURING EVA, CREW MEMBER COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86  C-469
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [ ]
SUBSYSTEM: EMU
MDAC ID: 653

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRESSURE BOOT ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
4) 

CRITICALITIES

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LOCATION:
PART NUMBER: 0104-82403-29/30

CAUSES: PUNCTURE. DEFECTIVE MATERIAL.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR IF SOP FAILS DURING EVA, CREWMEMBERS COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86 C-470
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                   HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM:   EMU          FLIGHT:        2/1R
MDAC ID:     654

ITEM:      PRESSURE BOOT ASSEMBLY
FAILURE MODE:  LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN    SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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8) 
9) 

CRITICALITIES
FLIGHT PHASE   HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0104-82403-29/30

CAUSES: LOOSE SCREW AT KEEPER BRACKET, MATERIAL FATIGUED/WORN.

EFFECTS/RATIONALE:
SECONDARY AXIAL RESTRAINT IS REDUNDANT. LOSS OF BOTH RESTRAINTS COULD RESULT IN LOSS OF SUIT PRESSURE INTEGRITY AND CREWPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-471
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:                HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU        FLIGHT: 3/3
MDAC ID: 655

ITEM: BOOT SIZING INSERT
FAILURE MODE: BOOTS INSERTS OUT OF PLACE

LEAD ANALYST: J. WHITMAN    SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA

CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0104-82664-17/18

CAUSES: DEFECTIVE VELCRO

EFFECTS/RATIONALE:
INSERTS ARE NOT MISSION OR LIFE/VEHICLE CRITICAL. NO IMPACTS.

REFERENCES:

REPORT DATE 12/02/86  C-472
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: EMU 
MDAC ID: 656

HIGHEST CRITICALITY HDW/FUNC 
FLIGHT: 2/2

ITEM: BODY SEAL CLOSURE (LTA SIDE) 
FAILURE MODE: JAMMED OPEN

LEAD ANALYST: J. WHITMAN 
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU 
2) SSA 
3) LTA 
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9787-05

CAUSES: FOREIGN MATTER IN MECHANISM

EFFECTS/RATIONALE:
IF JAMMED OPEN MISSION WOULD BE CANCELLED OR SUBSEQUENT MISSIONS TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-473
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [ ] [ ] [ ]
SUBSYSTEM: EMU
MDAC ID: 657

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: BODY SEAL CLOSURE (LTA SIDE)
FAILURE MODE: JAMMED CLOSED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9787-05

CAUSES: FOREIGN MATTER IN MECHANISM

EFFECTS/RATIONALE:
IF JAMMED CLOSED IT WOULD HAVE TO BE PRIED OPEN (PRYBAR AVAILABLE), THIS WOULD DAMAGE THE MECHANISM OF THE LOCK AND THUS CANCEL ANY UPCOMING EVAS.

REFERENCES:

REPORT DATE 12/02/86 C-474
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: [Date]
SUBSYSTEM: EMU
MDAC ID: 658

HIGHEST CRITICALITY HDW/FUNC FLIGHT: 2/1R

ITEM: BODY SEAL CLOSURE (LTA SIDE)
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
4) [List continues]

CRITICALITIES

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LOCATION:
PART NUMBER: A/L 9787-05

CAUSES: IMPROPER LIP SEAL DAMAGED O-RINGS.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP CAPABILITY OR IF SOP FAILS DURING EVA, CREWMEMBERS COULD BE LOST.

REFERENCES:

REPORT DATE 12/02/86 C-475
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: SUBSYSTEM: EMU
MDAC ID: 659 HIGHEST CRITICALITY HDW/FUNC

ITEM: BODY SEAL CLOSURE (LTA SIDE) FLIGHT: 2/1R
FAILURE MODE: LOCK MECHANISM FAILURE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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LOCATION: PART NUMBER: A/L 9787-05

CAUSES: LOCK SPRING BROKEN OR RELAXED.

EFFECTS/RATIONALE:
THIS IS A TWO LOCK MECHANISM WHERE IF EITHER OR BOTH FAIL THE MISSION SHOULD BE TERMINATED. IF BOTH LOCKS FAIL EVA, CREWMEMBER COULD BE LOST DUE TO SEPARATION OF HUT FROM LTA.

REFERENCES:

REPORT DATE 12/02/86 C-476
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86
SUBSYSTEM: EMU
MDAC ID: 660

ITEM: RESTRAINT ASSEMBLY
FAILURE MODE: ZIPPER JAMMED

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LCVG

CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0107-82968-07

CAUSES: TRAPPED MATERIAL, DEFECTIVE ZIPPER

EFFECTS/RATIONALE:
NO IMPACT ON MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-477
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86                  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU                  FLIGHT: 3/3
MDAC ID: 661

ITEM: RESTRAINT ASSEMBLY
FAILURE MODE: MATERIAL TORN

LEAD ANALYST: J. WHITMAN        SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LCVG
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0107-82968-07

CAUSES: MATERIAL PUNCTURED DUE TO CONTACT WITH HEAD OBJECT (SUCH AS A CONNECTOR).

EFFECTS/RATIONALE:
NO EFFECT ON EVA.

REFERENCES:

REPORT DATE 12/02/86        C-478
### INDEPENDENT ORBITER ASSESSMENT
#### ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 9/23/86  
**HIGHEST CRITICALITY** HDW/FUNC  
**SUBSYSTEM:** EMU  
**MDAC ID:** 662  
**FLIGHT:** 2/1R

**ITEM:** RESTRAINT ASSEMBLY  
**FAILURE MODE:** PUNCTURED OR LEAKING WATER TUBING

**LEAD ANALYST:** J. WHITMAN  
**SUBSYS LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**
1) EMU  
2) SSA  
3) LCVG

#### CRITICALITIES

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**REDUNDANCY SCREENS:**  
A [ 2 ]  
B [ P ]  
C [ P ]

**LOCATION:**
**PART NUMBER:** 0107-82968-07

**CAUSES:** FAULTY MATERIAL, DEFECTIVE BOND

**EFFECTS/RATIONALE:**
LOSS OF WATER. MISSION TERMINATED. VENT LOOP FLOODING WILL REQUIRE SOP USEAGE. IF PURGE VALVE (USED WITH SOP) IS BLOCKED BY WATER FREEZING IN IT, CREWPERSON CAN BE LOST.

**REFERENCES:**

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**REPORT DATE** 12/02/86  
**C-479**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/3
MDAC ID: 663

ITEM: LINER ASSEMBLY
FAILURE MODE: LINER TORN OR HAS HOLE IN IT

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LTA
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER: 0107-82973-02

CAUSES: TEAR, PUNCTURE, DEFECTIVE MATERIAL

EFFECTS/RATIONALE:
THIS IS A COMFORT DEVICE NOT REQUIRED FOR MISSION.

REFERENCES:

REPORT DATE 12/02/86 C-480
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86
SUBSYSTEM: EMU
MDAC ID: 664

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: VENT MANIFOLD AND DUCTS
FAILURE MODE: IMPAIRMENT OF FLOW THROUGH DUCTS AND MANIFOLD

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LCVG
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0107-811060-08/82568-09/81057-19/20

CAUSES: HOLE, TEAR, COLLAPSE, OR BLOCKAGE BY FOREIGN MATERIAL OF DUCT OR MANIFOLD

EFFECTS/RATIONALE:
IMPAIRED VENT FLOW WOULD REDUCE COOLING, CO2 REMOVAL, AND HUMIDITY CONTROL. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED. CREWPERSON LOSS IS POSSIBLE IF SOP ALSO FAILED.

REFERENCES:

REPORT DATE 12/02/86 C-481
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86
SUBSYSTEM: EMU
MDAC ID: 665

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: VENT MANIFOLD AND DUCTS
FAILURE MODE: COMPLETE BLOCKAGE OF FLOW THROUGH DUCTS AND MANIFOLDS

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LCVG
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: 0107-811060-08/82568-09/81057-19/20

CAUSES: BLOCKAGE OF DUCTS OR MANIFOLD BY FOREIGN MATERIAL

EFFECTS/RATIONALE:
THIS WOULD GREATLY IMPAIR COOLING CO2 CONTROL, AND OXYGEN DELIVERY TO CREWPERSON. THE SOP IS THE REDUNDANT SYSTEM. LOSS OF SOP WOULD ENDANGER THE CREW MEMBER.

REFERENCES:

REPORT DATE 12/02/86 C-482
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86
SUBSYSTEM: EMU
MDAC ID: 666

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/2

ITEM: MULTIUPLE CONNECTOR (LCVG HALF)
FAILURE MODE: WILL NOT MATE WITH HUT HALF

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LCVG

CRITICALITIES

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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9693-03/9697-04

CAUSES: ALIGNMENT PIN BROKEN

EFFECTS/RATIONALE:
IF HALVES CANNOT BE MATED, MISSION WOULD BE TERMINATED.

REFERENCES:

REPORT DATE 12/02/86 C-483
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 3/3
MDAC ID: 667

ITEM: MULTIPLE CONNECTOR (LCVG HALF)
FAILURE MODE: LEAKAGE WHEN DEMATED

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LCVG
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CRITICALITIES
FLIGHT PHASE  HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: A/L 9693-03/9697-04

CAUSES: SPRING BROKEN OR LOOSENED, DEFECTIVE 0-RING

EFFECTS/RATIONALE:
LEAKAGE WHEN NOT MATED WILL NOT IMPACT EVA MISSION.

REFERENCES:

REPORT DATE 12/02/86  C-484
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86
SUBSYSTEM: EMU
MDAC ID: 668

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/1R

ITEM: MULTIPLE CONNECTOR (LCVG HALF)
FAILURE MODE: LEAKAGE WHEN MATED

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) LCVG
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2


LOCATION:
PART NUMBER: A/L 9693-03/9697-04

CAUSES: BAD 0-RINGS, MISSING HOSE CLAMP SCREWS

EFFECTS/RATIONALE:
GRADUAL LOSS/DEGRADATION OF COOLING DUE TO LOSS OF WATER SUPPLY INTO THE EMU. THE WATER WOULD EVENTUALLY MIGRATE INTO AND FAIL THE VENT LOOP THEREBY REQUIRING SOP USEAGE. BECAUSE THE SOP REQUIRES A PURGE VALVE BE OPENED TO BE ACTIVATED, THIS TOO COULD BE FAILED BY WATER FREEZING IN THE PURGE VALVE AND BLOCKING IT. POSSIBLE LOSS OF CREWSPERSON.

REFERENCES:

REPORT DATE 12/02/86 C-485
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86    HIGHEST CRITICALITY: HDW/FUNC
SUBSYSTEM: EMU    FLIGHT: 2/2
MDAC ID: 669

ITEM: BITE VALVE ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN    SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) IDB
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 2/2
POST-EVA: 3/3


LOCATION:
PART NUMBER: 0110-24777-05

CAUSES: SEAL THREADS BROKEN DEFECTIVE Q-RING BROKEN SPRING PUNCTURE IN DIAPHRAM FOREIGN MATTER IN VALVE

EFFECTS/RATIONALE:
IDB NOT MANDATORY TO PERFORM EVA, HOWEVER, IF EVA, LEAKAGE WOULD CAUSE CREWPERSON DISCOMFORT AND COULD RESULT IN MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86    C-486
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 670

HIGHEST CRITICALITY: FLIGHT: 3/3
HDW/FUNC

ITEM: BITE VALVE ASSEMBLY
FAILURE MODE: CANNOT GET WATER FROM VALVE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) IDB

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0110-24777-05

CAUSES: FOREIGN MATTER IN VALVE. BROKEN OR LOOSE MOUTH PIECE

EFFECTS/RATIONALE:
IDB NOT MANDATORY TO PERFORM EVA.

REFERENCES:

REPORT DATE 12/02/86 C-487
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU  FLIGHT: 2/2
MDAC ID: 671

ITEM: BLADDER ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN  SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) IDB

CRITICALITIES

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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER: 0110-82829-10

CAUSES: PUNCTURE, HEAT SEAL FAILURE AT SEAM

EFFECTS/RATIONALE:
IDB NOT MANDATORY FOR EVA. LEAKAGE WOULD CAUSE CREWMAN DISCOMFORT. POSSIBLE MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-488
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**ITEM:** BLADDER ASSEMBLY  
**FAILURE MODE:** BAG DISLODGED

**LEAD ANALYST:** J. WHITMAN  
**subs LEAD:** G. RAFFAELLI

**BREAKDOWN HIERARCHY:**  
1) EMU  
2) SSA  
3) IDB  
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**CRITICALITIES**  
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**REDUNDANCY SCREENS:**  
A [ ]  
B [ ]  
C [ ]

**LOCATION:**  
**PART NUMBER:** 0110-82829-10

**CAUSES:** FAULTY VELCRO. FAULTY ADHESIVE ON VELCRO. BAG DISLODGED DURING DONNING

**EFFECTS/RATIONALE:**  
IDB NOT MANDATORY FOR EVA. MISPOSITIONED BAG COULD CAUSE CREWMAN DISCOMFORT.

**REFERENCES:**

REPORT DATE 12/02/86  
C-489
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 673

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: INLET VALVE ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) IDB
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CRITICALITIES

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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER: 0110-80010

CAUSES: SEAL THREADS BROKEN FOREIGN MATTER IN VALVE. STRETCHED VALVE

EFFECTS/RATIONALE:
IDB NOT MANDATORY FOR EVA. LEAKAGE WOULD CAUSE CREWMEMBER DISCOMFORT AND MAY IMPAIR VISIBILITY. POSSIBLE MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-490
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
FLIGHT: 3/3
MDAC ID: 674

ITEM: INLET VALVE ASSEMBLY
FAILURE MODE: VALVE FAIL CLOSED

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) IDB
4) INLET VALVE ASSEMBLY

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: /
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER: 0110-80010

CAUSES: FOREIGN MATTER IN VALVE. VALVE DEFECTIVE

EFFECTS/RATIONALE:
BAG WILL NOT FILL. IDB NOT MANDATORY FOR EVA.

REFERENCES:

REPORT DATE 12/02/86 C-491
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 675

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: ROLLON CUFF
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) UCD
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 2/2
POST-EVA: 3/3

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER:

CAUSES: PUNCTURE IN ROC, ROC UNSEATED FROM UCD FLANGE OR CREWMAN

EFFECTS/RATIONALE:
UCD NOT MANDATORY TO PERFORM EVA. HOWEVER, LEAKAGE DURING AN EVA
WOULD CAUSE CREW PERSON DISCOMFORT AND CAN PRESENT A HAZARD TO
THE PURGE VALVE (BY FREEZING AND BLOCKING IT) IF SOP WERE
REQUİRED.

REFERENCES:

REPORT DATE 12/02/86 C-492
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 676

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: VALVE
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) UCD
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: /
EVA: 2/2
POST-EVA: /

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER:

CAUSES: DEFECTIVE FLAPPER

EFFECTS/RATIONALE:
UCD NOT MANDATORY FOR EVA; HOWEVER, IF IT WERE TO FAIL CLOSED
URINE WOULD LIKELY ESCAPE TO THE SUIT ENVIRONMENT. POSSIBLE
CREWPERSON DISCOMFORT AND MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-493
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 677

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: BLADDER
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAElli

BREAKDOWN HIERARCHY:
1) EMU
   2) SSA
   3) UCD
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CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: /
EVA: 2/2
POST-EVA: /

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER:

CAUSES: PUNCTURE OF BLADDER

EFFECTS/RATIONALE:
UCD NOT MANDATORY FOR EVA, BUT LEAKAGE COULD LEAD TO CREWMAN DISCOMFORT. POSSIBLE MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-494
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**REDUNDANCY SCREENS:**

| A [ ] | B [ ] | C [ ] |

**LOCATION:**

**PART NUMBER:**

**CAUSES:**
BAD ADHESIVE ON VELCRO. BAD VELCRO. MISSIZED OR TORN HARNESS

**EFFECTS/RATIONALE:**

UCD NOT MANDATORY FOR EVA. BUT MISPOSITIONING COULD LEAD TO CREWMAN DISCOMFORT AND MISSION TERMINATION.

**REFERENCES:**

**REPORT DATE 12/02/86 C-495**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 679

ITEM: HARNESS
FAILURE MODE: HARNESS LOOSE

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) UCD
4) HARNESS
5)
6)
7)
8)
9)

CRITICALITIES
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION:
PART NUMBER:

CAUSES: MISSIZED HARNESS TORN HARNESS

EFFECTS/RATIONALE:
UCD NOT MANDATORY TO EVA. IF EVA MISSIZED OR TORN HARNESS COULD LEAD TO MISPOSITIONED UCD WHICH COULD CAUSE SIGNIFICANT CREWPERSON DISCOMFORT AND MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86 C-496
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: EMU
MDAC ID: 680

HIGHEST CRITICALITY
FLIGHT: 2/2

ITEM: CCA
FAILURE MODE: LOSS OF POWER TO MIKE/LOSS OF SIGNAL

LEAD ANALYST: J. WHITMAN
SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3) 
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES

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REDUNDANCY SCREENS: A [ ]   B [ ]   C [ ]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRONICS SHORT

EFFECTS/RATIONALE:
LOSS OF TRANSMIT CAPABILITY, MISSION TERMINATION.

REFERENCES:

REPORT DATE 12/02/86  C-497
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: EMU          FLIGHT:  3/2R
MDAC ID: 681

ITEM: CCA
FAILURE MODE: LOSS OF SIGNAL TO EARPHONE (1 OF 2)

LEAD ANALYST: J. WHITMAN    SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:
1) EMU
2) SSA
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRONICS SHORT

EFFECTS/RATIONALE:
LOSS OF RECEIVE CAPABILITY IF BOTH EARPHONES FAIL, MISSION TERMINATION WOULD THEN RESULT.

REFERENCES:

REPORT DATE 12/02/86   C-498
### APPENDIX D

#### POTENTIAL CRITICAL ITEMS

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<td>BLADDER FAILURE (O2/H2O)</td>
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<td>BLADDER FAILURE (O2/H2O MIX)</td>
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